

SWITCHBOARD
Technical Manual

PART 2 CHAPTER 3B

NAVY TYPE ACB-1600HR
CIRCUIT BREAKER

WESTINGHOUSE TYPE DBN-1016

REMOVABLE ASSEMBLY
1600-AMPERE FRAME SIZE
STANDARDIZED DIMENSIONS



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EAST PITTSBURGH, PA., U.S.A.

TECHNICAL MANUAL 32-855-3C1

PRELIMINARY DATA

PURPOSE

A circuit breaker has two fundamental purposes: First, to perform normal switching operations to isolate a circuit, and second, to isolate a circuit under fault conditions.

CAUTION - WARNING - THE CIRCUIT BREAKER SHOULD BE IN THE OPEN POSITION AND THE SWITCHBOARD DE-ENERGIZED BEFORE INSTALLING, ADJUSTING, INSPECTING, REPLACING PARTS, OR REMOVING THE CIRCUIT BREAKER. IF THE BUS CANNOT BE DE-ENERGIZED, USE INSULATED HANDLE TOOLS, RUBBER GLOVES, AND A RUBBER FLOOR MAT.

INSTALLATION

The movable component must be removed before stationary component can be bolted in switchboard. Normal care in handling the stationary component is sufficient.

After securing the stationary component the movable component should be lifted by hooks in the "lifting holes".

When installing the circuit breaker, care should be taken to see that the supporting surface is even and vertical, and that all leads to be connected to the circuit breaker are de-energized. Protect the circuit breaker from dirt and possible damage.

The connections to the circuit breaker studs should be cleaned, flat and free of burrs to assure full contact area, and firmly clamped or bolted in place to prevent excessive heating. The connecting cables should have adequate current carrying capacity. Connecting cables should be supported so that the circuit breaker studs will not be subjected to unnecessary strain.

At no time should the circuit breaker be allowed to rest upon or be supported by the current studs. This will result in unnecessary damage and stress to the studs and the insulated moldings.

Any discoloration or pitting of the circuit breaker contacts in evidence when the circuit breaker is received from the manufacturer is

caused by calibrating the breaker and will in no way interfere with proper functioning of the circuit breaker.

MAINTENANCE

Periodic inspection of the breaker is recommended. An inspection should always be made after it is known that the breaker has opened on a severe short circuit. When a circuit breaker is not operated for long periods of time, a high resistance oxide or sulfide may form on the contact surfaces which results in overheating. To burn off this high resistance film, operate the circuit breaker several times under normal load at regular inspection periods.

Be sure the breaker is disconnected from all sources of power before inspecting or repairing.

If excessive heating occurs, look for loose or corroded contacts or connections.

When inspecting the breaker, examine the contacts to see if there has been any severe pittings or burning of the contact surfaces which will prevent proper contact wipe. Rough or high spots should be removed with a very fine, clean file or fine, clean sandpaper.

LUBRICATION

In general, the breaker mechanism requires very little lubrication which should be applied sparingly. Any excessive amount of oil on the breaker parts is apt to collect dust and dirt and is to be avoided.

The lubrication applied during manufacture should be sufficient for the life of the breaker.

REPLACING PARTS

Before replacing any part, the operator should note the position of each part before removing.

When removing or replacing tension springs with hooks, the work may be facilitated by pulling on the hooks with a cord or a wire.

TABLE OF CONTENTS

<u>Description</u>	<u>Page</u>
CHAPTER 1 - GENERAL INFORMATION	1-1
SECTION 0 - GENERAL DATA	1-1
CIRCUIT BREAKER CHARACTERISTICS	1-1
Rating of Components	1-1
Auxiliary Switch	1-2
SECTION 1 - INTRODUCTION	1-2
GENERAL	1-2
SECTION 2 - DETAILED DESCRIPTION	1-5
CIRCUIT BREAKER	1-5
General	1-5
Movable Component	1-5
Pole Unit	1-5
Arc Chute	1-7
Operating Mechanism	1-7
Closing Relay	1-8
Closing Solenoid	1-9
Shunt Trip Device	1-13
Anti-Shock-Close Device	1-13
Anti-Shock-Open Device	1-14
Series Overcurrent Trip Unit	1-17
Auxiliary Switch	1-18
Main Disconnects	1-18
Secondary Disconnects	1-20
Indicator Lights	1-20
Silicon Rectifier	1-21
Cell Interlock	1-21
Extension Rails	1-21
CHAPTER 2 - PRINCIPLES OF OPERATION	2-1
SECTION 1 - GENERAL PRINCIPLES	2-1
GENERAL	2-1
Description	2-1
Closing	2-1
Tripping	2-3
Electrical Operation	2-3
CHAPTER 3 - OPERATING INSTRUCTIONS	3-1
SECTION 1 - PRECAUTIONS	3-1
SAFETY PRECAUTIONS	3-1

TABLE OF CONTENTS (Cont'd)

<u>Description</u>	<u>Page</u>
CHAPTER 4 - INSTALLATION	4-1
SECTION 1 - INSTALLATION INSTRUCTIONS	4-1
GENERAL	4-1
CHAPTER 5 - MAINTENANCE	5-1
SECTION 1 - PREVENTIVE MAINTENANCE	5-1
PERIODIC PROCEDURES	5-1
General	5-1
SECTION 2 - CORRECTIVE MAINTENANCE	5-1
GENERAL INSTRUCTIONS	5-1
General	5-1
Chassis	5-1
Pole Units	5-1
Arc Chute	5-2
Operating Mechanism	5-2
Closing Relay	5-3
Closing Solenoid	5-3
Shunt Trip Device	5-4
Anti-Shock-Close Device	5-4
Anti-Shock-Open Device	5-4
Overcurrent Trip Device	5-5
Auxiliary Switch	5-5
Main Disconnects	5-5
Secondary Contacts	5-5
Indicator Lights	5-5
Silicon Rectifier	5-6
Drawout Interlock	5-6
Extension Rails	5-6
CHAPTER 6 - REPAIR PARTS LIST	6-1
SECTION 1 - REPAIR PARTS LIST INTRODUCTION	6-1
PARTS IDENTIFICATION	6-1
Circuit Breaker	6-1
Repair Part Ordering	6-1
SECTION 2 - REPAIR PARTS TABULATION	6-1
REPAIR PARTS TABULATION	6-1
Repair Parts	6-1
CHAPTER 7 - DRAWINGS	7-1
SECTION 1 - GENERAL	7-1

LIST OF ILLUSTRATIONS

CHAPTER 1 - GENERAL INFORMATION

SECTION 1 - INTRODUCTION

<u>Figure</u>		<u>Page</u>
1-1-1	Removable Assembly and Stationary Component	1-3
1-1-2	Movable Component.	1-4

SECTION 2 - DETAILED DESCRIPTION

1-2-1	Circuit Breaker Movable Component	1-5
1-2-2	Arc Chute and Pole Unit Assembly	1-6
1-2-3	Operating Mechanism with Position Indicator	1-8
1-2-4	Closing Relay	1-10
1-2-5	Closing Solenoid and Relay Trip Assembly	1-11
1-2-6	Shunt Trip Device	1-12
1-2-7	Anti-Shock-Close Device	1-13
1-2-8	Anti-Shock-Open Device	1-14
1-2-9	Typical Time Current Curves	1-15
1-2-10	Overcurrent Trip Device	1-16
1-2-11	Auxiliary Switch	1-19
1-2-12	Main and Secondary Disconnects	1-20
1-2-13	Indicator Light	1-21
1-2-14	Silicon Rectifier	1-21

CHAPTER 2 - PRINCIPLES OF OPERATION

SECTION 1 - GENERAL PRINCIPLES

2-1-1	Wiring Diagram	2-2
2-1-2	Schematic Symbols	2-3

CHAPTER 5 - MAINTENANCE

SECTION 2 - CORRECTIVE MAINTENANCE

5-2-1	Relay Contact Adjustment	5-4
-------	------------------------------------	-----

CHAPTER 7 - DRAWINGS

SECTION 1 - GENERAL

7-1-1	Air Circuit Breaker Removable Assembly	7-3,7-4
7-1-2	Air Circuit Breaker Stationary Components	7-5,7-6

LIST OF TABLES

CHAPTER 1 - GENERAL INFORMATION

SECTION 0 - GENERAL DATA

<u>Table</u>	<u>Page</u>
1-0-1 Circuit Breaker Classification Data	1-1
1-0-2 Current Rating of Components	1-1
1-0-3 Voltage Rating of Components	1-2
1-0-4 Auxiliary Switch	1-2

CHAPTER 1 GENERAL INFORMATION

Section 0—General Data

1-0-1 CIRCUIT BREAKER CHARACTERISTICS

The circuit breaker classification data is listed in Table 1-0-1.

1-0-1-1 Rating of Components

The rating of the components are listed in Tables 1-0-2 and 1-0-3.

TABLE 1-0-1—CIRCUIT BREAKER CLASSIFICATION DATA

Type	Navy Type ACB 1600HR (W.E. Corp. Type DBN1016)
Frame Size (continuous rating)	1600 Amperes
Voltage	500 Volts
Current	A-C
Frequency	60 Cycles
Poles	3
Continuous Current Rating (Trip Coil)	800,1000,1200,1400,1600 Amperes
Interrupting Capacity	100,000 (RMS) Amperes
Short Time Rating	100,000 (RMS) Amperes
Short Time Duration	30 Cycles
Means of Closing	Electrical and Emergency Manual
Auxiliary Switch	8
Mounting	Removable Assembly - Dead Front
Connections	Back
Insulation Class	B
Shock Classification	Class HI
Ambient Temperature	50°C
Protective Functions	Overcurrent, Long Delay Tripping, Short Delay Tripping (Bands 1,2&3), Instantaneous Tripping, Shunt Trip
Master Drawing	Westinghouse #900J232 (2 sheets)
Navy Test Approval	5419-31 of 20 March 1959
Weights -	
Complete Removable Assembly	560 lbs.
Movable Component Only	440 lbs.
Stationary Component Only	120 lbs.
Overcurrent Device	10 lbs.

TABLE 1-0-2—CURRENT RATING OF COMPONENTS

Components	Duty (Amperes)	Load Duration (Seconds)	Allowable Operations Per Minute
115V. Closing Relay	4 Intermittent	1/5	10
450V. Closing Relay	1 Intermittent	1/5	10
115V. Closing Magnet	80 Intermittent	1/10	10
450V. Closing Magnet	20 Intermittent	1/10	10
115V. Shunt Trip	4 Intermittent	1/10	10
450V. Shunt Trip	1 Intermittent	1/10	10
Auxiliary Switch	15 Intermittent	(For interrupting rating see table)	
Secondary Disconnects	15 Intermittent	(No interrupting rating)	
Wiring to Aux. Switch	10 Intermittent	(Unless contract specifies more)	

CIRCUIT BREAKER

**TABLE 1-0-3—VOLTAGE RATING
OF COMPONENTS**

Components	Nominal Rating (Volts)	Voltage Range Volts
Closing Relay and Magnet	115 450	90-130 360-500
Shunt Trip	115 450	80-130 360-500

1-0-1-2 Auxiliary Switch

The interrupting capacities of the auxiliary switch contacts are listed in Table 1-0-4.

TABLE 1-0-4—AUXILIARY SWITCH

Volts	Non-Inductive Circuit	Inductive Circuit
115 a-c	75 amps.	15.0 amps.
450 a-c	25 amps.	5.0 amps.

Section 1—Introduction

1-1-1 GENERAL

This technical manual describes a Navy Type ACB 1600HR (Westinghouse Type DBN-1016) 1600-ampere frame size air circuit breaker, meeting the requirements of Specification MIL-C-17587 for Naval Shipboard service. Each circuit breaker is supplied as a complete, removable switchboard assembly consisting of circuit breaker, separable disconnects and associated control wiring, drawout mechanism and assembly structural supports and back plate including stationary main bus connections and stationary terminals for connection of the necessary external control wiring.

The complete, removable assembly consists of two major components; the stationary component that is bolted into the switchboard frame, and the movable component which is the operating mechanism of the circuit breaker and may be drawn out for inspection, maintenance or isolation from the shipboard electrical system.

The general arrangement of this equipment is shown in figures 1-1-1 and 1-1-2.

The DBN-1016 air circuit breaker is a complete, removable assembly for installation within a switchboard cubicle.

The circuit breaker is designed as an assembly including the drawout mechanism. These assemblies incorporate disconnect features for both main current connections and secondary current connections. This mounting allows easy

removal and installation of the movable component when maintenance operations are required.

The circuit breaker is closed electrically from a local or remote control switch. It may be tripped from the control switch or may be tripped by depressing the "Push-To-Trip" button which protrudes through the face plate.

For maintenance, the emergency closing handle provides manual closing by inserting the operating handle, through the face plate, into the socket provided in the operating mechanism and pulling the operating handle down (approximately 45 degrees) until the breaker latches.

The moving component consists of a rigid steel chassis to which are bolted various sub-assemblies. Each sub-assembly is a complete unit and is readily interchangeable between breakers. In addition, each sub-assembly may be removed intact and easily replaced for minimum outage time.

The sub-assemblies required in all breakers are the mechanism, pole units, arc chutes, auxiliary switch, secondary disconnects, anti-shock-closed-device, anti-shock-open-device, closing relay, and closing magnet. The remaining sub-assemblies that may be included are overcurrent trip devices and shunt trip device.

The air circuit breaker for three phase a-c service is normally provided with overcurrent trip devices in the two outer poles, otherwise the three poles are identical.

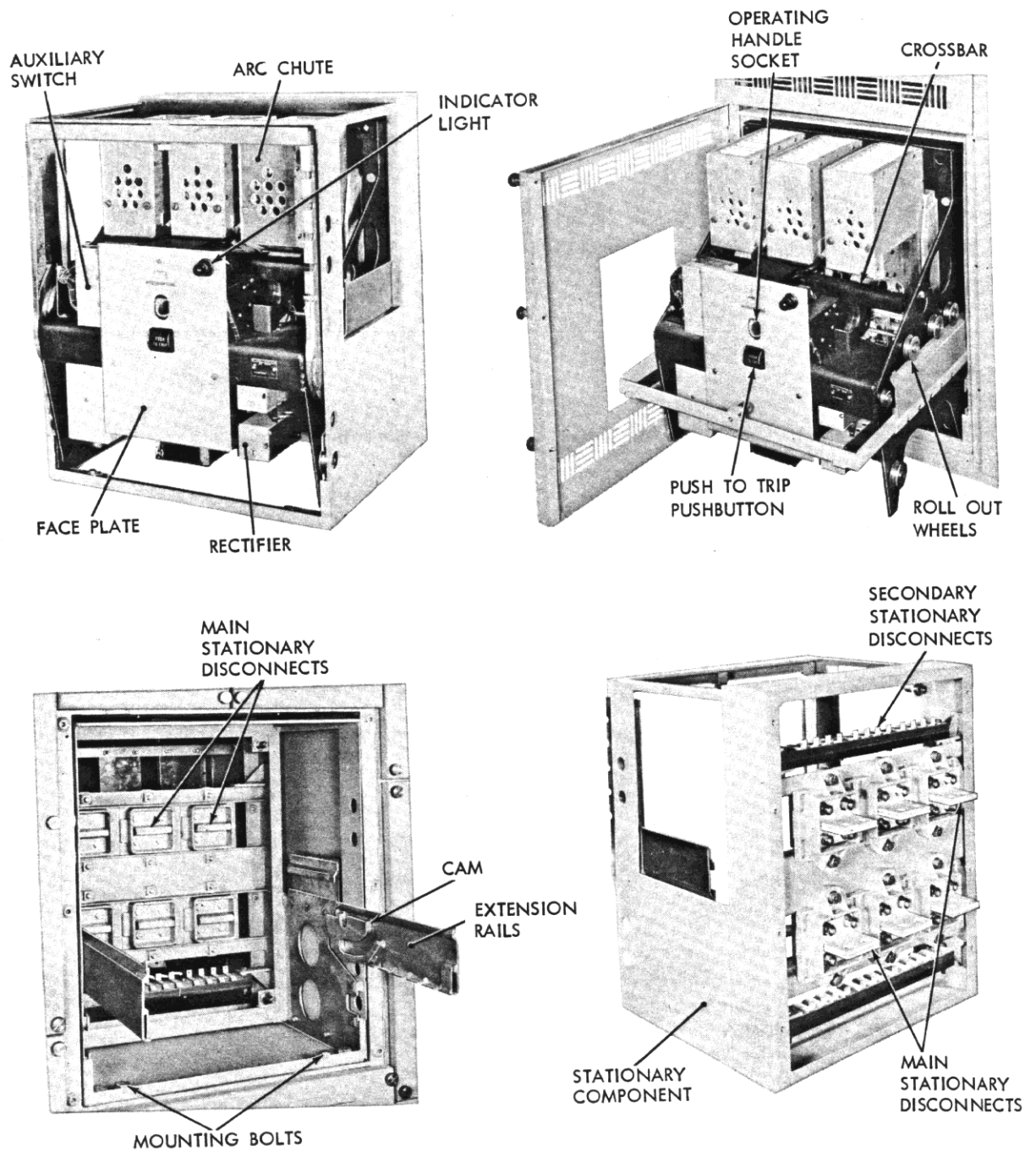


FIGURE 1-1-1 — Removable Assembly and Stationary Component

CIRCUIT BREAKER

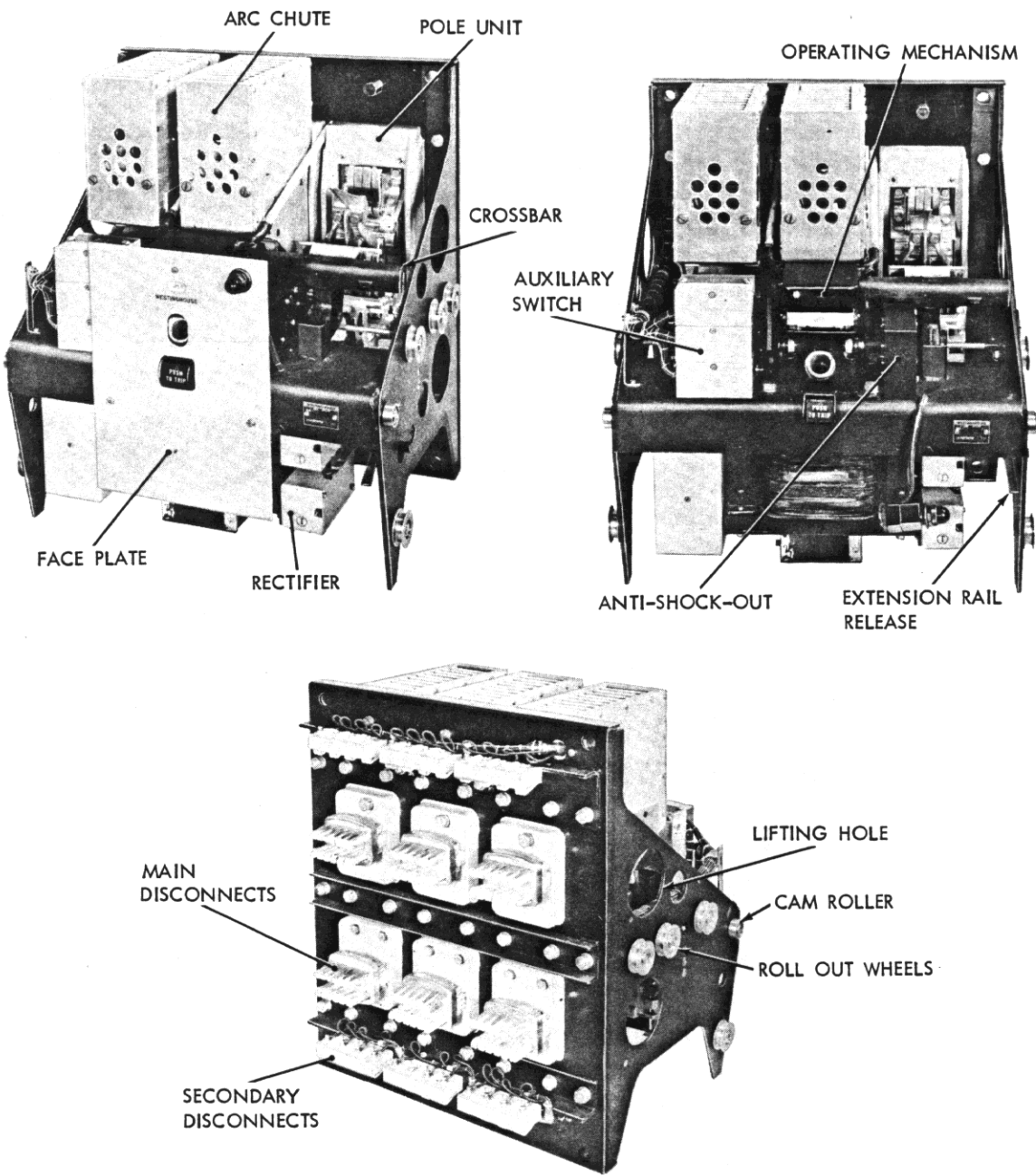


FIGURE 1-1-2 — Movable Component

Section 2—Detailed Description

1-2-1 CIRCUIT BREAKER

1-2-1-1 General

Paragraph 1-1-1 describes the general details and subsequent paragraphs describe various sub-assemblies in detail.

1-2-1-2 Movable Component—(See Figure 1-2-1)

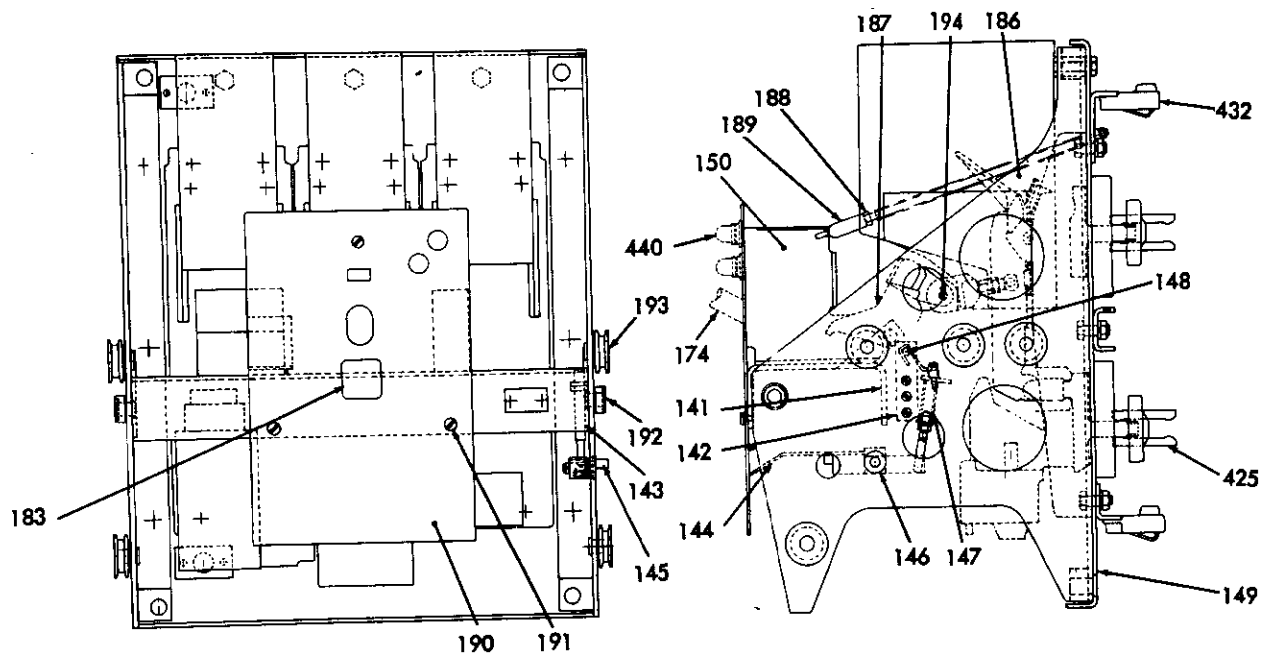
This assembly consists of a rigid steel panel (149), two supporting frames (186), and shelf (141). The supporting frames are bolted to the front of the steel panel and support the shelf. Move out rollers and the lever roller are attached to the side of each of the supporting frames. A lifting hole has been drilled in

each of the supporting frames to assist in raising the movable component when drawn out of the stationary component.

1-2-1-3 Pole Unit—(See Figure 1-2-2)

Three separate pole units are bolted to the front of the steel panel, one for each of the three phases. Each pole unit consists of a base, a stationary contact assembly and a moving contact assembly. The base is molded from Navy Type MAI-60 insulating material and isolates the stationary and moving contacts from the chassis.

The stationary contact assembly consists of the main stationary contact receptacle (138),



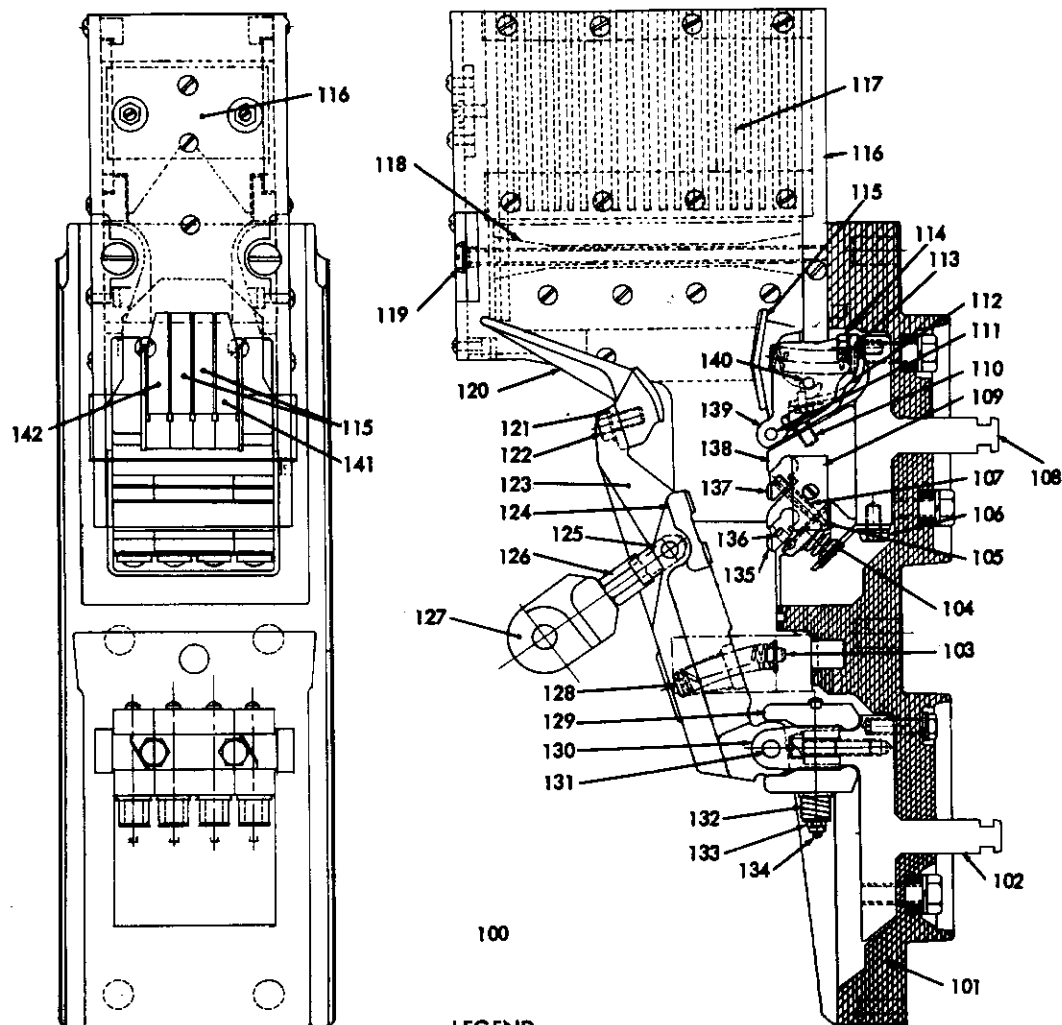
LEGEND

141	SHELF	149	PANEL	190	FACE PLATE
142	TRIP BAR BEARING PLATE	150	OPERATING MECHANISM	191	SCREW
143	LEVER UNIT	174	OPERATING HANDLE	192	ROLLER
144	LEVER HANDLE	183	TRIP BUTTON	193	ROLLOUT WHEEL
145	STOP PIN	186	SUPPORTING FRAME	194	PIN
146	PIN	187	CROSS BAR	425	MAIN DISCONNECT
* 147	SPRING	188	LOCKNUT	432	SECONDARY DISCONNECT
148	TRIP BAR	189	TIE STUD	440	INDICATING LIGHT

* REPAIR PARTS

FIGURE 1-2-1 — Circuit Breaker Movable Component

CIRCUIT BREAKER



LEGEND

- 100 POLE UNIT
- 101 BASE
- 102 LOWER STUD
- 103 SPRING SEAT
- * 104 MAIN CONTACT SPRING
- 105 PRESSURE PLATE
- 106 BOLT
- 107 PRESSURE PIN
- 108 UPPER STUD
- 109 LOCK PLATE
- 110 BOLT
- 111 PIVOT PIN
- 112 SHUNT
- * 113 SPRING, ARCING CONTACT
- * 114 BOLT
- * 115 STATIONARY ARCING CONTACT -CENTER
- 116 ARC CHUTE
- 117 PLATE
- 118 TUBE SPACER
- 119 SCREW
- * 120 MOVING ARCING CONTACT

*REPAIR PARTS

- 121 LOCK CLIP
- 122 BOLT
- 123 MOVING CONTACT ARM
- 124 MAIN MOVING CONTACT
- 125 LOCK PLATE
- 126 TURNBUCKLE
- 127 INSULATING LINK
- * 128 SPRING, ACCELERATING
- 129 AUXILIARY CONTACT
- 130 HINGE
- 131 PIN
- * 132 SPRING, AUXILIARY CONTACT
- 133 NUT
- 134 SCREW
- 135 MAIN CONTACT FINGER
- 136 PRESSURE PIN
- 137 MAIN CONTACT FINGER
- 138 MAIN STATIONARY CONTACT RECEPTACLE
- 139 HINGE
- 140 PIN
- * 141 STATIONARY ARCING CONTACT - R H
- * 142 STATIONARY ARCING CONTACT - L H

FIGURE 1-2-2 — Arc Chute and Pole Unit Assembly

the upper stud (108), the main contact fingers (135) and (137), pins (107) and (136), pressure plate (105), main contact spring (104), arcing contact (115), the arcing contact spring (113), pin (111) and shunt (112). The main stationary contact is bolted to the base (101) and the arcing contact is pivoted on pin (111). The main and arcing contacts are connected electrically by shunt (112).

The main stationary contact fingers (135) and (137) are ball ends which pivot in sockets. Main contact pressure is equalized by the main contact spring (104) through pressure plate (105) and pressure pins (107) and (136).

Limited rotation about pin (111) provides for arcing contact overtravel while the arcing contact spring (113) maintains the required contact pressure. The overtravel feature permits the arcing contact to close first and remain closed until after the main contacts have separated. The contact surfaces of the arcing contacts are special arc resistant alloy inserts.

The moving contact assembly consists of a contact arm (123) of copper to which is fastened arcing contact (120) by two bolts (122) which are locked by lockclip (121). The main contacts are an integral part of the moving contact arm (123) and the contact tips are silver brazed in position. The auxiliary contacts (129) carry the current from the moving contact assembly to the lower stud. Spring (132) provides the required contact finger pressure between the moving contact assembly and the lower stud.

1-2-1-4 Arc Chute—(See Figure 1-2-2)

The arc chute (116) mounted above and surrounding the contact assembly of each pole, stretches and cools the arc drawn between the separating contacts so that the arc may be extinguished and the circuit opened in the least possible time. The arc chutes are an extremely important part of the circuit breaker and a breaker should never be energized without their being mounted in place.

Each arc chute consists of a number of metal plates and asbestos plates (117) supported in a laminated case and held in place by a clamping plate, insulating tube spacers (118) and two screws (119) through the insulating spacers to the molded base (101). When the arc is drawn by the separating contacts, it moves up into the chute by magnetic and thermal action where it is quickly de-ionized and extinguished.

1-2-1-5 Operating Mechanism—(See Figure 1-2-3)

The operating mechanism opens and closes the circuit breaker by moving the cross bar (187) (Figure 1-2-1) to which the moving contact assemblies are attached. It is mounted on the top of the shelf at the center of the circuit breaker.

The operating mechanism consists of a group of toggle links and a latch attached to the operating mechanism frame on fixed pins (154), (157), (171), (173), (179) and (182). The cross bar is held by the closing lever (158). Depressing the operating handle moves the operating mechanism from the open to the closed position. This is accomplished when the end of the handle socket (175) forces the first toggle link (172) upward, pushing the second toggle link (165), the third toggle link (163) and the closing lever (158) ahead of it. The motion of the toggle linkages is directed by link (160) which is pivoted at its lower end on pin (155), in latch (156). Latch (156) in turn is restrained from moving by roller latch (159) which is pivoted on pin (179) and engages trigger (180) on the trip lever. The linkage is held in the closed position by pawl (164).

In electrical operation, plunger rod of the closing solenoid bears directly on pin (177) thus engaging linkage and closing breaker.

The mechanism is opened by rotation of the trip bar (151) counterclockwise. This is accomplished either by pushing the "Push To Trip" button, in which case the pushbutton rotates latch (153), or by causing the tripping attachment to strike trip finger (152). In either case, the counterclockwise rotation of the trip lever moves trigger (180) out of engagement with the lower end of the roller latch (159), which in turn permits the roller latch to rotate counterclockwise out of engagement with latch (156). Latch (156) is then free to rotate in response to the pull of the link (160) so that the mechanism assumes the trip free position shown in Figure 1-2-3 in which the contacts are open, but part of the mechanism levers are in the closed position. In this position pawl (164) is disengaged permitting the linkage to collapse to the open position.

Position indicator (170) is an integral part of the mechanism, formed from sheet metal and pivoted on pin (171). It is visible from the front of the circuit breaker through a window in the faceplate and mechanism frame. With the circuit breaker in the open position shown

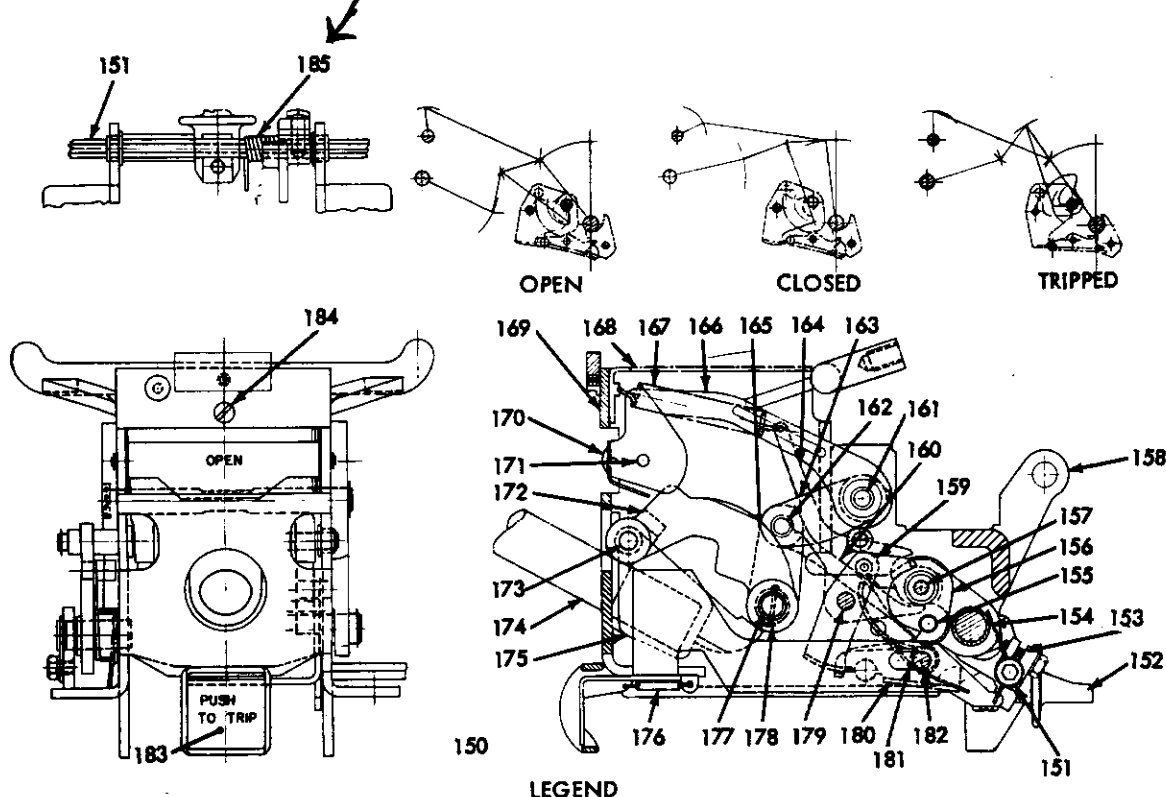
CIRCUIT BREAKER

in Figure 1-2-3, the yellow face of the indicator shows through the window. The word "Open" is stamped on this yellow face. When the breaker closes, pin (161) of the closing lever (158) pulls indicator link (166) to the right, thus rotating the other face of the indicator up into position visible through the window. This face is painted blue and is stamped with the word "Closed". The position indicator

provides a positive visual indication of the operating condition of the circuit breaker.

1-2-1-6 Closing Relay—(See Figure 1-2-4)

The closing relay is used on electrically operated breaker only and is mounted on the left side of the closing solenoid. This relay closes and opens the closing coil circuit of the



- 150 OPERATING MECHANISM
- 151 TRIP BAR
- 152 TRIP FINGER
- 153 LATCH
- 154 PIN
- 155 PIN
- 156 LATCH
- 157 PIN
- 158 CLOSING LEVER
- 159 ROLLER LATCH
- 160 LINK
- 161 PIN
- 162 PIN
- 163 THIRD TOGGLE LINK
- 164 PAWL
- 165 SECOND TOGGLE LINK
- 166 INDICATOR LINK
- * 167 SPRING PAWL

*REPAIR PARTS

- 168 COVER
- 169 FRAME
- 170 POSITION INDICATOR
- 171 PIN
- 172 FIRST TOGGLE LINK
- 173 PIN
- 174 OPERATING HANDLE (EMERGENCY)
- 175 HANDLE SOCKET (EMERGENCY)
- * 176 SPRING, TRIP BUTTON
- 177 PIN
- 178 COTTER PIN
- 179 PIN
- 180 TRIGGER
- * 181 SPRING, LATCH
- 182 PIN
- 183 TRIP BUTTON
- 184 SCREW
- * 185 SPRING, TRIP BAR

FIGURE 1-2-3 — Operating Mechanism with Position Indicator

CHAPTER 1—GENERAL INFORMATION

solenoid, in electrical operation. The relay provides a means of closing the circuit breaker electrically from a remote point through a control switch.

The relay base (238) is molded from insulating material. The contact assemblies, coil assembly and other parts are attached to the base. Frame (203) holds the coil in place and serves as part of the magnetic circuit of coil (206). The frame or yoke is secured to the molded base by three screws (208). The coil (206) is held in place by guide tube (207). The relay is enclosed by molded cover (211) which is secured by screw (239).

The moving core (204) is free to slide up and down in the guide tube (207). In moving up in response to the magnetic pull from the stationary core when the coil is energized, the moving core pulls up latch (229) which is fastened with pin (227) to the moving core. When the coil (206) is energized, spring (225) bearing against latch (229) holds the latch in such a position that it is hooked under latch pin (230), causing moving contact arm assembly to rotate counterclockwise around contact arm pin (232), thereby compressing spring (235). The moving contacts (236) are thus pulled against the stationary contacts (237) completing the circuit.

As the pin (230) is moved upward toggle links (228) and (224) are raised. Toggle link (228) pivots on pin (223) and toggle link (224) is attached to the moving contact arm (234) which pivots on pin (231). As the toggle links move upward, the contact arm is rotated counterclockwise and the relay contacts are closed. When the relay contacts close, current starts flowing through the coil (250) (Figure 1-2-5) of the closing solenoid. The moving core (245) of the solenoid moves up closing the circuit breaker. Trip bracket (257) fastened to the moving core of the solenoid forces the first trip lever (225) of the relay trip assembly up; increased spring tension rotates second trip lever (253) which strikes the relay trip pin (201) (Figure 1-2-4) forcing it upward. The trip pin rotates the trip crank (220) which engages the latch (229) and rotates it clockwise against the torque exerted by torsion spring (225). The rotation of latch (229) disengages latch pin (230), the toggle links (224) and (228) collapse and spring (235) rotates the moving contact arm (234) clockwise to snap the moving contacts (236) away from the stationary contacts (237).

The main moving contacts (236) are fastened to the contact arm (234) which is molded

from insulating material. Silver alloy contact tips are brazed on the contact legs.

The main stationary contacts are made from spring material and are "U" shaped. They are secured to the base by screws (240). The "U" shape arrangement causes a slight rolling and wiping action on the spherically shaped contact surfaces, as they meet, which helps to insure a positive electrical connection.

With the circuit breaker in the closed position, the trip pin (201) of the relay is held in the trip position. Therefore, even though the relay coil may be inadvertently energized when the circuit breaker is latched, the relay contacts will not close and no current can flow through the circuit breaker closing coil.

With the circuit breaker in the closed position, if the control switch is held closed, the moving core (204) will remain up with normal or low control voltage. If breaker is tripped open, relay latch (229) cannot engage latch pin (230) until control switch is opened. Thus breaker is "Anti-Pump" under low voltage conditions and will not reclose until control switch is opened and closed again.

Two blowout coils (216) and (217) and two arc chambers are provided so that the arc drawn by the separating contacts may be extinguished and the circuit opened in the least possible time. The blowout coils are held in place by two iron plates and secured by screws (218). The blowout magnet coil is connected in series with the contacts, which causes flux to flow through the magnetic circuit and the air gap of the blowout magnet assembly. The magnetic circuit is positioned so its air gap is across the arc chamber and the arc. At the time the contacts part and draw an arc, the arc is deflected by the magnetic force down into the arc chamber where it is extinguished due to the stretching and cooling process. This arrangement makes possible a small and efficient relay.

The relay is provided with a "seal-in" feature through the auxiliary contact (244) which can be connected in parallel with the control switch in the relay coil circuit. If this connection is made, once energized the relay will remain closed until breaker closing solenoid completes its stroke.

1-2-1-7 Closing Solenoid—(See Figure 1-2-5)

The closing solenoid is designed to operate on direct current of rectifier (See Paragraph 1-2-1-16) and is used to close the circuit

CIRCUIT BREAKER

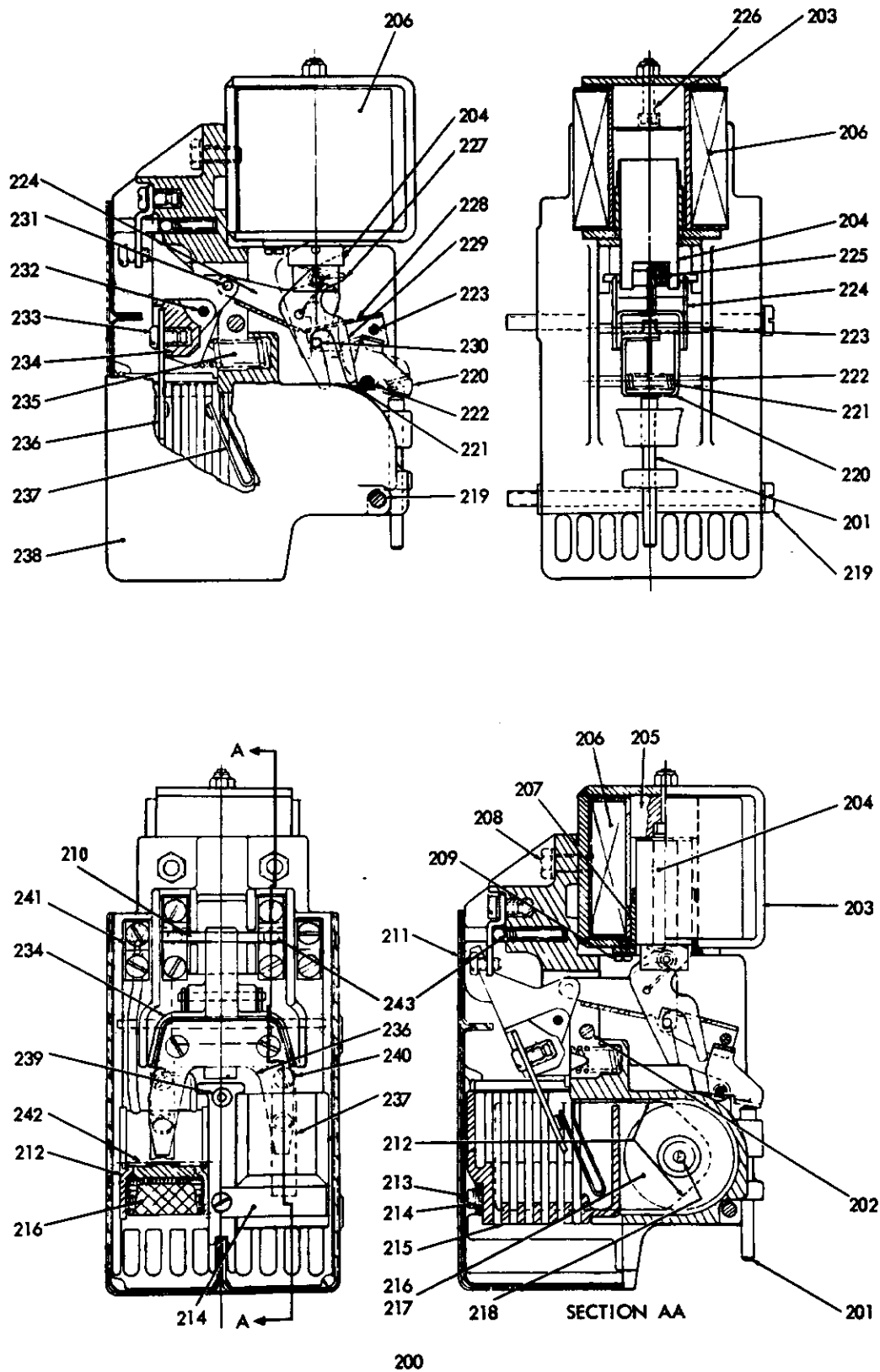


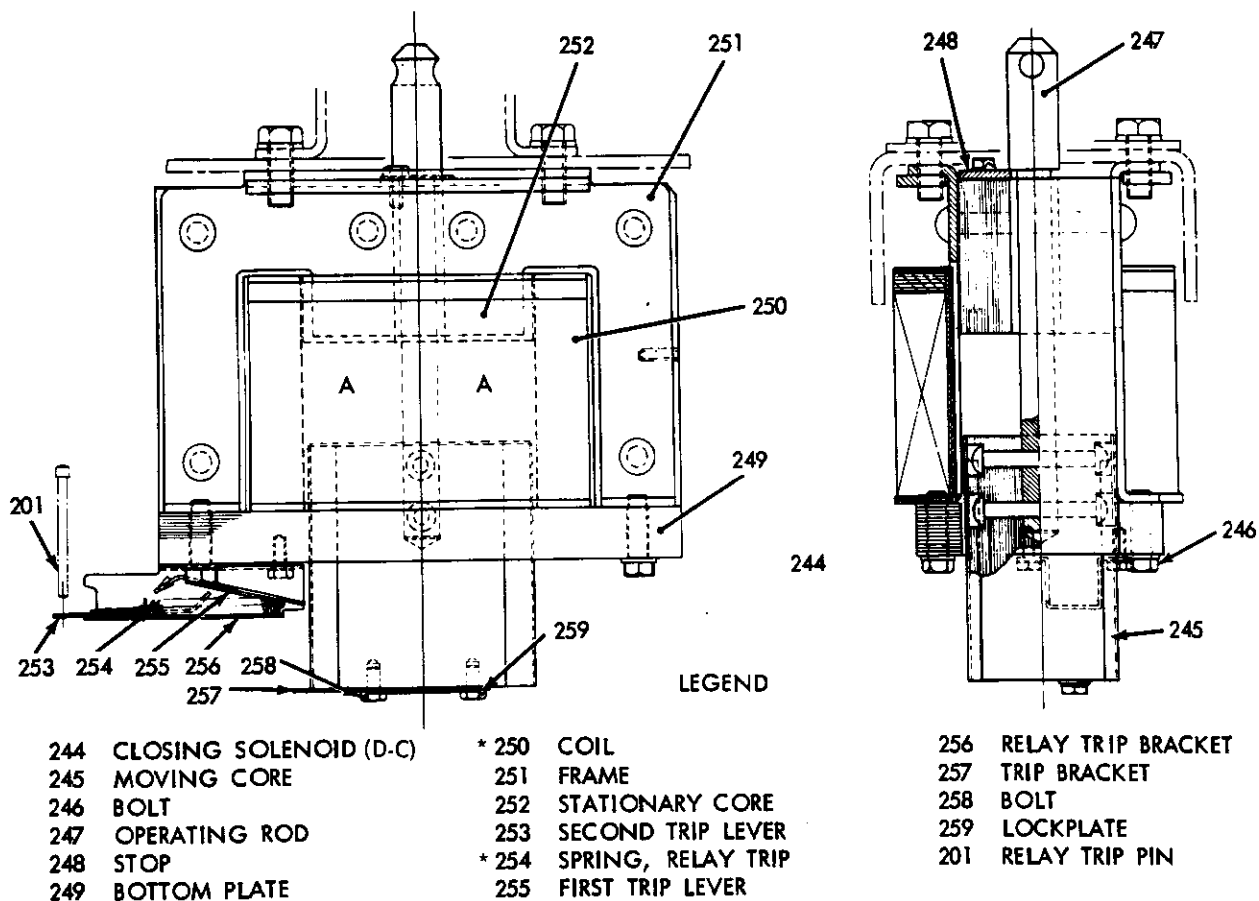
FIGURE 1-2-4 — Closing Relay

CHAPTER 1—GENERAL INFORMATION

- | | |
|------------------------------------|-----------------------------------|
| 200 Closing Relay | 222 Trip Crank Pin |
| 201 Trip Pin | 223 Pin |
| 202 Pin | 224 Second Toggle Link |
| 203 Coil Frame | *225 Spring, Latch |
| 204 Movable Core | 226 Stationary Core Mounting Bolt |
| 205 Stationary Core | 227 Drive Pin |
| *206 Control Coil | 228 First Toggle Link |
| 207 Bushing | 229 Latch |
| 208 Mounting Screw | 230 Pin |
| 209 Bushing Screw | 231 Pin |
| 210 Contact, Auxiliary | 232 Pin |
| 211 Cover | 233 Movable Contact Screw |
| 212 Side Plate | 234 Movable Contact Arm |
| 213 Screw | *235 Contact Arm Spring |
| 214 Arcing Chamber Retaining Strip | *236 Movable Contact |
| 215 Arcing Chamber | *237 Stationary Contact |
| *216 Blowout Coil - Left Hand | 238 Base |
| *217 Blowout Coil - Right Hand | 239 Cover Screw |
| 218 Side Plate Screw | 240 Stationary Contact Screw |
| 219 Relay Mounting Screw | 241 Main Circuit Terminal |
| 220 Trip Crank | 242 Magnetic Core |
| *221 Spring, Trip | *243 Spring, Auxiliary Contact |

*Repair Parts

FIGURE 1-2-4 — Closing Relay



*REPAIR PARTS

FIGURE 1-2-5 — Closing Solenoid and Relay Trip Assembly—
Electrically Closed Breakers

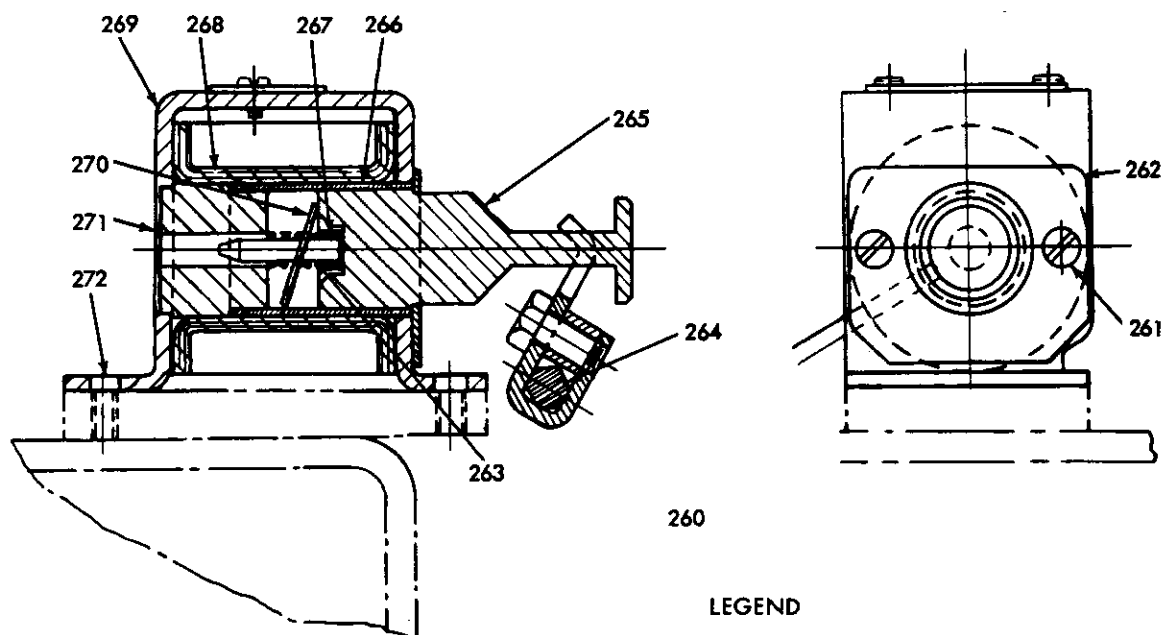
CIRCUIT BREAKER

breaker electrically and is mounted directly below the mechanism and under the shelf (141) (Figure 1-2-1) of the circuit breaker. It is secured to the shelf by the same four bolts that holds the mechanism in place.

The closing solenoid consists of an iron frame or yoke (251) which is bolted to the circuit breaker shelf, a plunger or moving core, an operating rod (247), a stationary core (252) and a coil (250).

The operating rod (247) connects the moving core (245) to pin (177) (Figure 1-2-3) of the mechanism. When coil (250) is energized through the contact of the closing coil (Refer to Paragraph 1-2-1-6), the moving core (245) moves upward in response to the magnetic attraction between the stationary and moving cores across air gap "A". About one-tenth of a second is required for the solenoid to close and latch the

circuit breaker. The moving core is provided with a trip bracket (257) and when the moving core moves into the "breaker closed" or "closed gap" position, trip bracket (257) engages the first trip lever (255) of the relay trip assembly. As the first trip lever (255) is forced upward, increased tension on spring (254) rotates second trip lever (253) which engages the relay trip pin (201) (Figure 1-2-4) of the closing relay to trip the relay, the relay contacts open, de-energizing the closing solenoid. The coil of the closing solenoid is momentarily rated and serious damage will result if potential is allowed to remain on its terminals through improper adjustment of the relay trip pin (201) so that the relay does not trip and interrupt the closing coil circuit (Refer to Paragraph 1-2-1-6). When the moving core and operating arm have pushed the mechanism linkage to the closed and latched position, pin (177) (Figure 1-2-3) of the operating mechanism holds the moving core in the



LEGEND

260	SHUNT TRIP DEVICE	266	SLEEVE
261	SCREW	* 267	SPRING
262	PLATE	* 268	COIL
263	PIN	269	FRAME
264	TRIP BAR	270	NON-MAGNETIC WASHER
265	MOVING CORE	271	STATIONARY CORE
		272	BOLT

*REPAIR PARTS

FIGURE 1-2-6 — Shunt Trip Device

CHAPTER 1—GENERAL INFORMATION

"closed gap" position. When the mechanism (150) is tripped, pin (177) falls, allowing the operating arm and the moving core to fall to the "open gap" position.

1-2-1-8 Shunt Trip Device—(See Figure 1-2-6)

The shunt trip device is used on electrically operated breakers and is mounted on the breaker shelf.

The shunt trip device consists of a frame (269), stationary core (271), moving core (265) and the trip coil (268). Energizing the trip coil (268) sets up a magnetic attraction between stationary core (271) and moving core (265). The moving core moves to the left which rotates trip bar (264) to trip the circuit breaker. The opening of the circuit breaker de-energizes

the shunt trip coil through a normally open auxiliary switch contact. Spring (267) then returns the moving core (265) to its normal position. Non-magnetic washer (270) prevents residual magnetism from holding the cores together when the coil is de-energized.

1-2-1-9 Anti-Shock-Close Device—(See Figure 1-2-7)

The anti-shock-close device (280) is mounted on the side of the operating mechanism. This device prevents the circuit breaker contacts from closing from shock when the breaker is in the open position. This device also, functions as an anti-bounce latch.

The anti-shock-close latch (281) is pivoted on the side of the mechanism. The plate is so shaped that the impact of shock rotates the de-

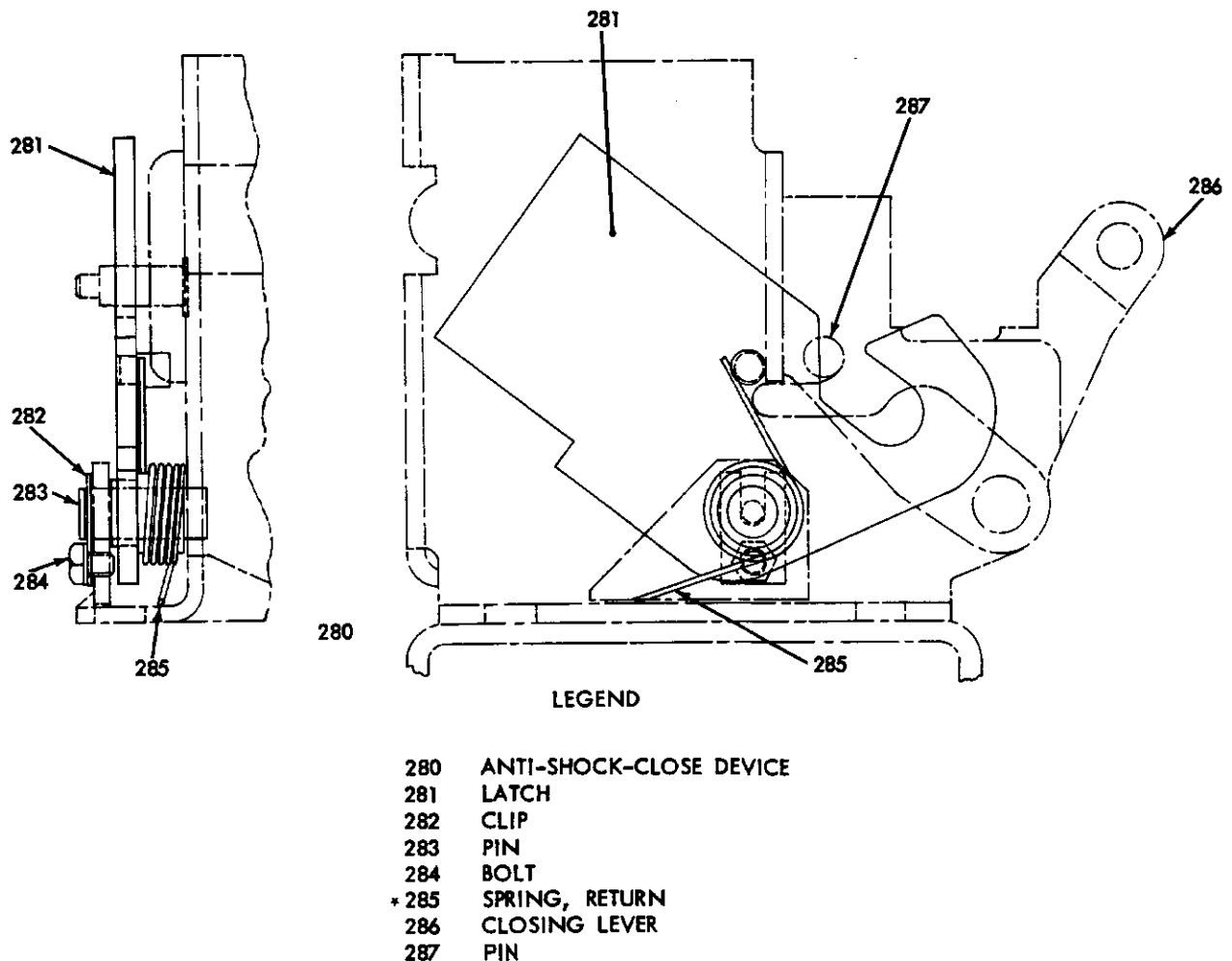


FIGURE 1-2-7 — Anti-Shock-Close Device

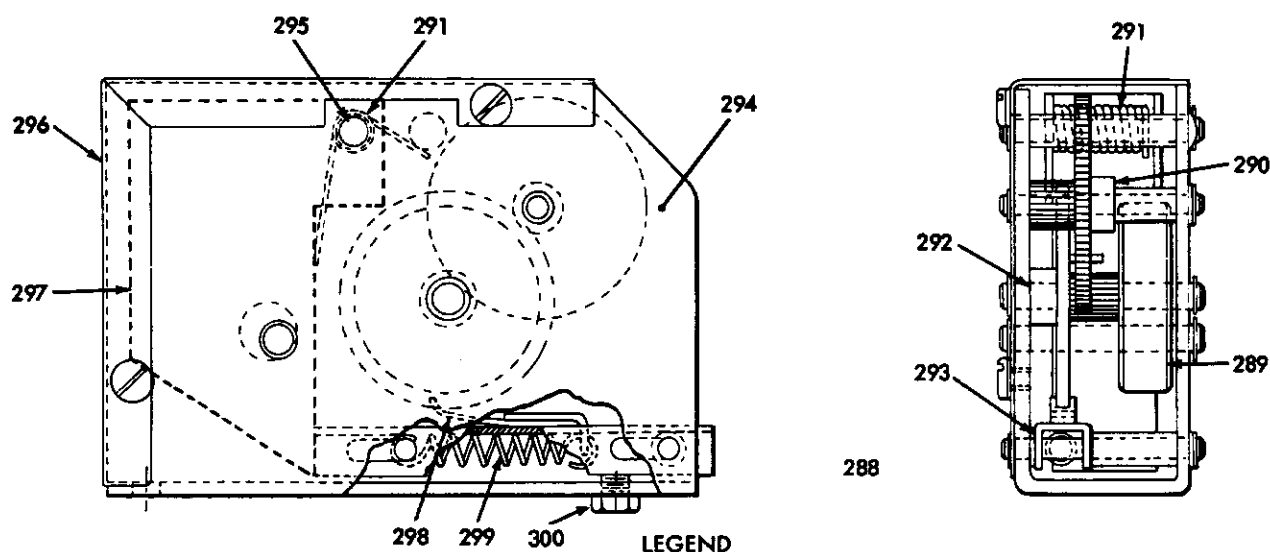
CIRCUIT BREAKER

vice, and the hook engages pin (287) of the operating mechanism to momentarily hold the breaker open. The anti-shock-close device also serves as an anti-bounce latch to prevent the closing lever (286) from bouncing off its stops and re-closing the circuit when the circuit breaker interrupts maximum short circuit currents. Under these conditions the crossbar knocks the latch up, causing the latch to engage the cross bar pin to momentarily hold the breaker open. Return spring (285) returns the latch to its original position when conditions are normal.

1-2-1-10 Anti-Shock-Open Device—(See Figure 1-2-8)

The anti-shock-open device prevents tripping of the circuit breaker due to rotation of the trip lever caused by shock when breaker is in the closed position and is mounted on the circuit breaker shelf to the right of the operating mechanism frame.

The anti-shock-open device consists of a frame (294), cover (296), weight (297), lever (293), spring clip (298), lever spring (299), weight spring (291) and a gear train. The gear train is composed of two torque reducing gears (290) and (292) and a round unit of rotating mass (289). Under shock conditions, the weight (297) is rotated about pin (295). As the weight rotates, it forces the lever (293) outward to block the trip bar and prevent breaker tripping. During the outward movement of the lever, spring clip (298) acts as a ratchet on gear (292) allowing the lever to move without rotation of the gear train. Weight spring (291) returns the weight to its original position. When lever spring (299) starts to return the lever to the original position, the spring clip (298) engages the teeth of gear (292) causing rotation of the gear train. The rotation of the gear train causes a time delay in the return direction. This time delay holds the trip bar for the duration of the shock.



288 ANTI-SHOCK-OPEN DEVICE
289 ROTATING MASS
290 GEAR
* 291 SPRING, WEIGHT
292 GEAR
293 LEVER
294 FRAME

295 PIN
296 COVER
297 WEIGHT
298 SPRING CLIP
* 299 SPRING, LEVER
300 BOLT

*REPAIR PARTS

FIGURE 1-2-8 — Anti-Shock-Open Device

CHAPTER 1—GENERAL INFORMATION

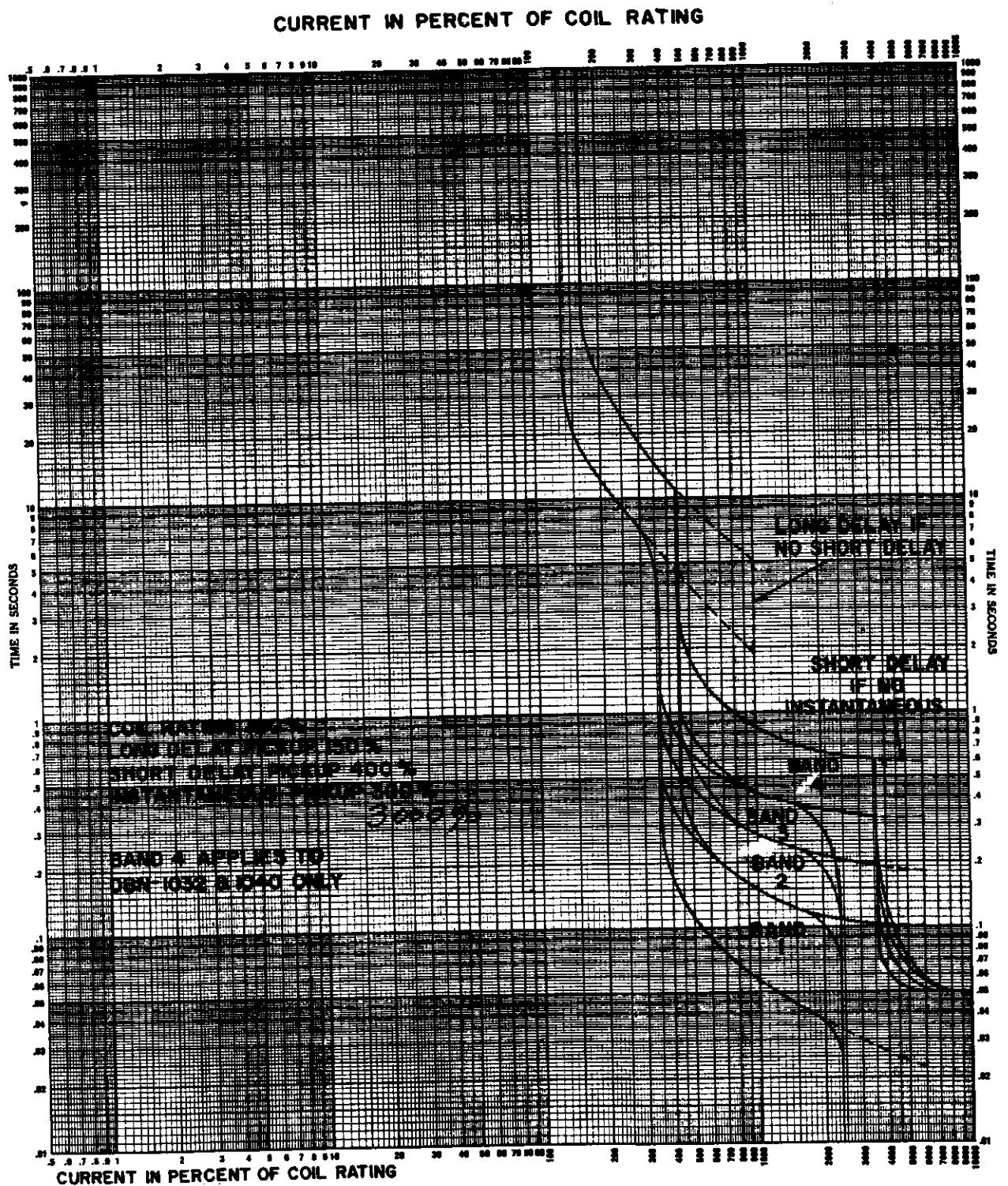


FIGURE 1-2-9 — Typical Time Current Curves

CIRCUIT BREAKER

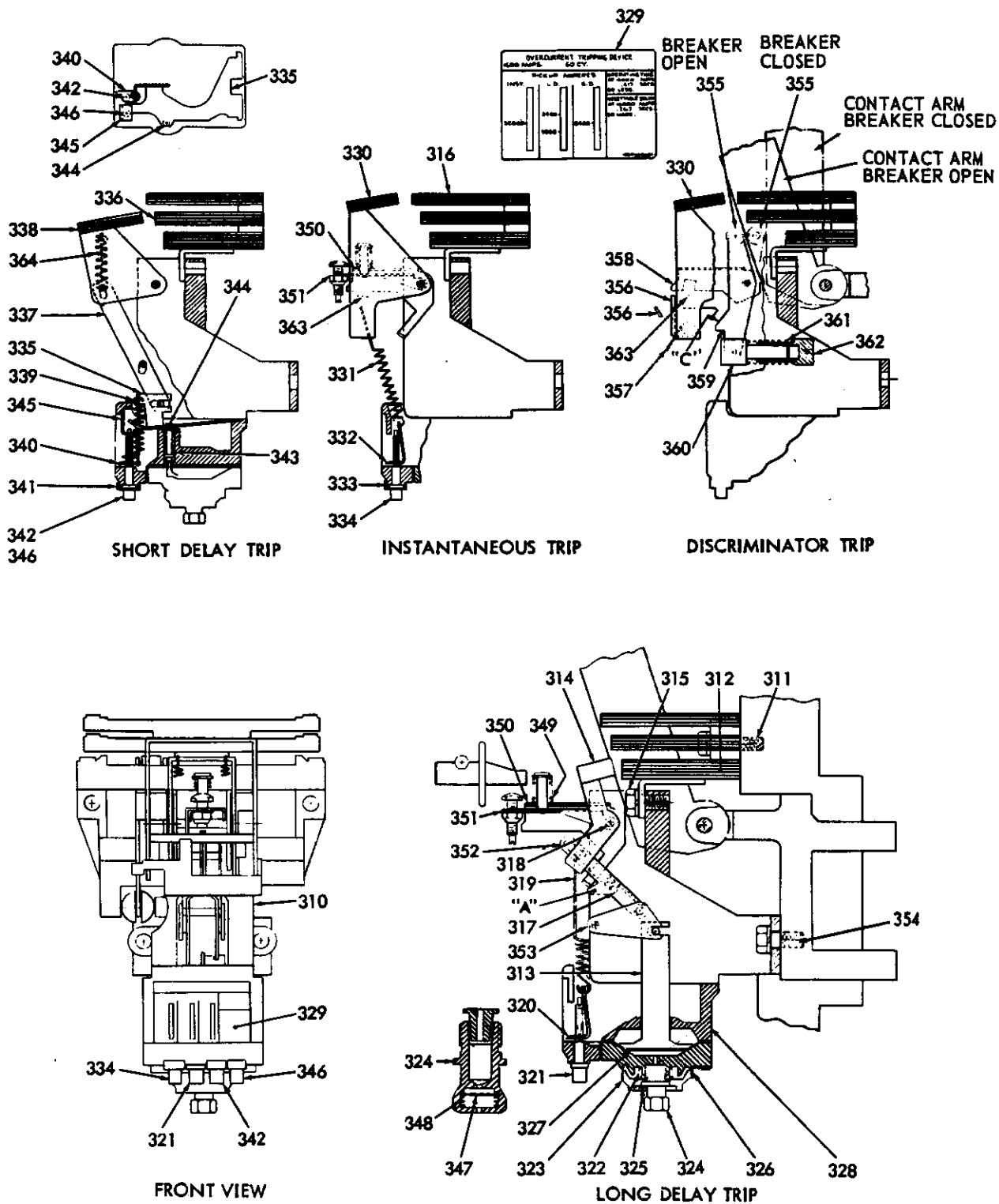


FIGURE 1-2-10 — Overcurrent Trip Device

310 Overcurrent Trip Unit	329 Scaleplate	*348 Spring (Disc)
311 Yoke Mounting Bolt	330 Upper Armature	*349 Spring (Trip)
312 Stationary Yoke	*331 Spring (Instantaneous)	350 Crank
313 Stem Assembly	332 Pointer (Instantaneous)	351 Trip Crank
314 Lower Armature	333 Clip	352 Link
315 Upper Mounting Bolt	334 Screw (Instantaneous)	353 Lever
316 Stationary Yoke	335 Lever	354 Lower Mounting Bolt
*317 Spring, Limit	336 Stationary Yoke	355 Roller
318 Pin	337 Line	356 Latch
*319 Spring (L.D. Pickup)	338 Center Armature	*357 Spring, Latch
320 Pointer (L.D. Pickup)	*339 Spring (S.D. Pickup)	358 Crank
321 Screw (L.D. Pickup)	340 Pointer (S.D. Pickup)	359 Lever
*322 Spring (L.D. Dial)	341 Clip	360 Piston
323 Dial (L.D.)	342 Screw (S.D. Pickup)	*361 Spring Piston
324 Valve (L.D. Time)	*343 Spring (S.D. Valve)	362 Cylinder
325 Screw	344 Valve (S.D.)	363 Pin
326 Clip	345 Bracket	*364 Spring, Follow
327 Diaphragm (Part of 313)	346 Screw (S.D. Time)	
328 Moulded Case	347 Disc (Reset)	

*Repair Parts

FIGURE 1-2-10 — Overcurrent Trip Device

1-2-1-11 Series Overcurrent Trip Unit— (See Figures 1-2-9 and 1-2-10)

Series overcurrent trip unit provides for selective protection under three distinct conditions of overcurrent: First, low overcurrents will trip breaker after LONG DELAY; Second, moderate overcurrents will trip breaker after a SHORT DELAY; and third, high overcurrents will trip breaker INSTANTLY.

Two calibrated long delay pickup settings are marked on scaleplate (329) in amperes (at approximately 150 and 200% of coil rating). The long delay time is factory set per Figure 1-2-9. By turning dial (323) the long delay time can be approximately halved or doubled; but is locked to prevent excessive adjustment. The short delay pickup, short delay time, and instantaneous pickup are all factory set and sealed. The pickup currents and time delay are marked on scaleplate.

Figure 1-2-9 shows a typical "Time-Current-Curve". The upper line of a given band shows the MAXIMUM TIME for breaker to clear the circuit for any given overcurrent. The lower line shows the MINIMUM time an overcurrent can exist before returning to normal without tripping breaker.

The overcurrent trip device is mounted by bolts (311), (315) and (354) to the pole units. The stationary yokes (312), (316) and (336) and the moving armatures (314), (330) and (338) form a laminated iron loop around the breaker

moving contact arm. Current flow in contact arm creates a magnetic force between stationary yokes and the moving armatures in the direction to pivot armatures clockwise about pin (318).

When armature (314) rotates, spring (317) transmits force via lever (353) to stem assembly (313). As stem assembly (313) moves, projection (A) on link (352) rotates crank (350) clockwise. Crank (350) via spring (349) and rivet pin will rotate trip crank (351) to actuate breaker trip bar. Spring (349) limits force applied to breaker trip system.

The long delay pickup is adjusted by turning screw (321) which moves pointer (320) and lower end of springs (319). Spring (319) holds down armature (314) unless overcurrent exceeds calibrated pickup. The rate at which the stem will rise depends on the vacuum drag on the diaphragm (327). The diaphragm is part of stem assembly (313). Valve (324) controls the amount of air which can flow into the vacuum chamber. Turning dial (323) clockwise closes the tapered long delay orifice. Spring (322) and clip (326) prevent accidental change in adjustment and screw (325) prevents excessive intentional adjustment.

The instantaneous pickup is factory set by turning screw (334) which moves pointer (332) and lower end of spring (331). Spring (331) will hold down armature (330) until magnetic attraction of yoke (316) lifts armature. When

CIRCUIT BREAKER

the armature rises pin (363) will lift crank (350) to trip breaker instantly. Clip (333) is cemented to screw (334) to protect factory setting.

The short delay pickup is factory set by turning screw (342) which moves pointer (340) and lower end of spring (339). Spring (339) will hold down lever (335), link (337) and armature (338) until magnetic attraction of yoke (336) lifts armature. When the armature rises, lever (335) will lift valve (334) and allow a controlled amount of air to flow thru port to vacuum chamber. This controlled air flow will allow long delay tripping parts to react for short delay tripping. Turning screw (346) moves bracket (345) which limits motion of lever (335). This adjustment controls air flow around valve (344) and pre-determined short delay time required to trip breaker. Two clips (341) are cemented to screws (342) and (346) to protect factory setting.

These overcurrent trip units have a quick reset valve. If a unit has partially or completely reacted to an overcurrent condition and then the current subsides to zero or normal, a quick reset is desirable. As stem assembly (313) comes down, air is expelled thru port to bottom of long delay valve (324). Pressure moves disc (347) down providing a large opening for the expelled air. Spring (348) returns the disc to the sealed position after reset is completed.

When selective coordination requires that instantaneous tripping be omitted, a discriminator trip is supplied. The discriminator will NOT trip a breaker that is closed; but will instantaneously trip a breaker that is closing if the inrush current is above 40,000 amperes. The discriminator trip operates similar to an instantaneous trip except additional parts are required and slot (E) is added to crank (358).

If breaker is closed, spring (361) forces projection (c) on lever (359) to rotate latch (356) away from projection (D) on crank (358). Although high fault currents will rotate armature (330) NEITHER pin (363) nor latch (356) can engage crank (358) and breaker will not trip unless fault current duration allows short delay tripping.

If breaker is open, contact arm movement of roller (355) will rotate lever (359) away from latch (356). Spring (357) places latch (356) into position to engage crank projection (D). Piston (360) and cylinder (362) create a small time delay so that latch (356) will not rotate on closing stroke of breaker until breaker is completely closed. If on the closing stroke, a fault

current of 40,000 amperes or more appear then armature (330) will carry latch (356) with it and rotate crank (358) and cause breaker to trip.

1-2-1-12 Auxiliary Switch—(See Figure 1-2-11)

The auxiliary switch is mounted on top of the circuit breaker shelf to the left of the operating mechanism.

The eight pole auxiliary switch (400) consists of two four pole switches; one mounted above the other. A third switch case, which contains a terminal block (422), is mounted above the switches.

Each auxiliary switch is a shaft operated four pole rotary type containing either normally open or normally closed contacts or a combination of normally open and normally closed contacts. The normally open or "a" contacts are open when the circuit breaker is in the open position and the normally closed contacts or "b" contacts are closed when the circuit breaker is open.

The rotor assembly consists of a square shaft (404), rotor ends (415) and (417), three rotor sections (416), moving contacts (401), arm (412), bushing (418) and screw (419) which clamps together the rotor assembly.

Each contact finger (405) backed by spring (406), is secured by a rivet and is attached to stem (407), which is secured to the case by collar (408). Screws (411) and a crimp washer provide the terminal connections.

Link (420) is attached to the breaker lever of the operating mechanism. As the link is rotated by the action of the operating mechanism, arm (412) rotates the shaft (404) to reposition the moving contacts.

The moving contacts are set 90 degrees apart for a 90 degree rotation of the shaft. The contacts can be converted in the field to either normally open or normally closed by rotating the appropriate rotor section 90 degrees on the shaft.

1-2-1-13 Main Disconnects—(See Figure 1-2-12)

The main disconnects are mounted on the studs of the moving component of the circuit breaker, one on each of the six breaker studs.

Each main disconnect consists of a finger retainer (428), the finger cluster (426) and two finger springs (427). The assembly is held on

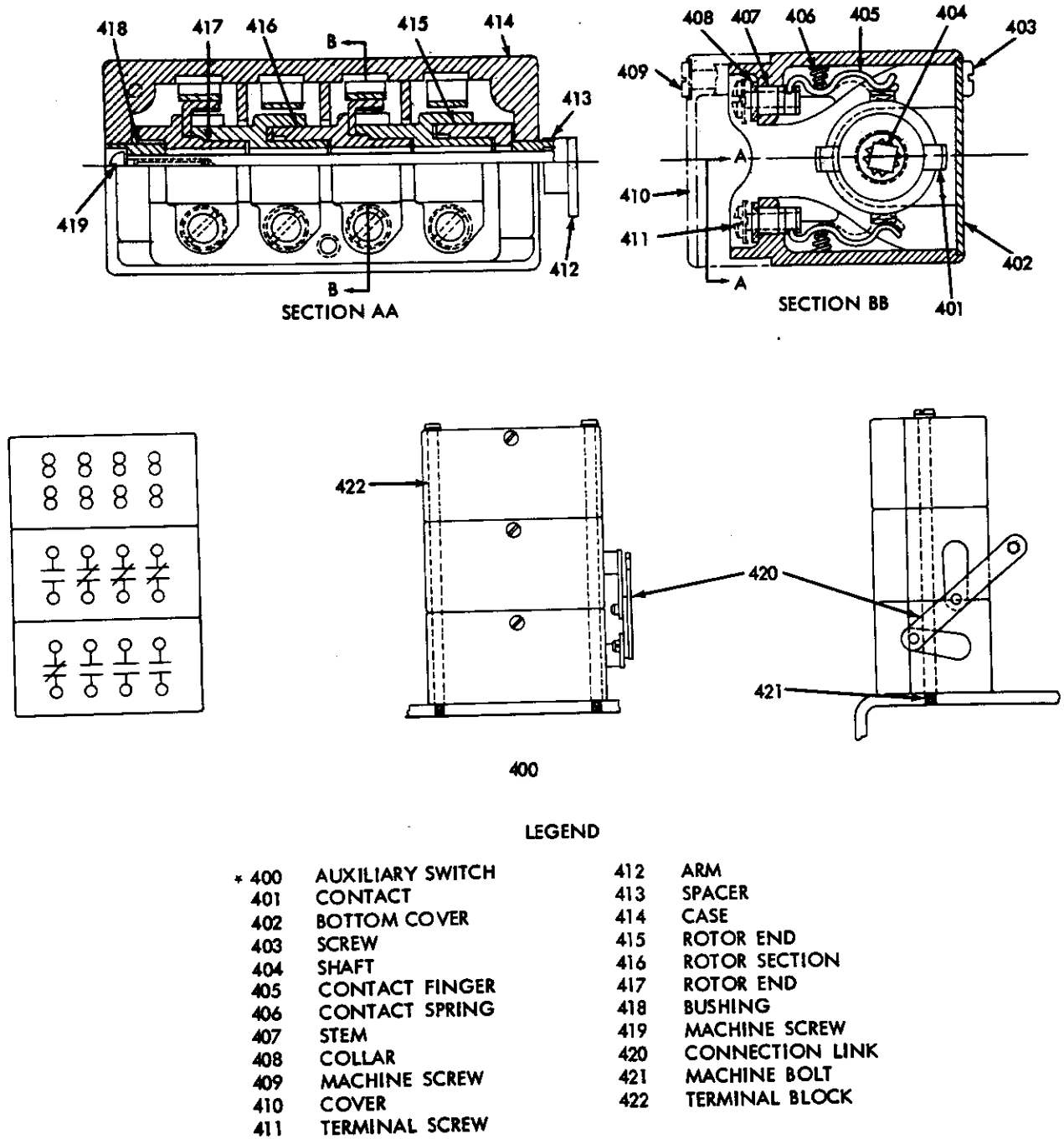


FIGURE 1-2-11 — Auxiliary Switch

CIRCUIT BREAKER

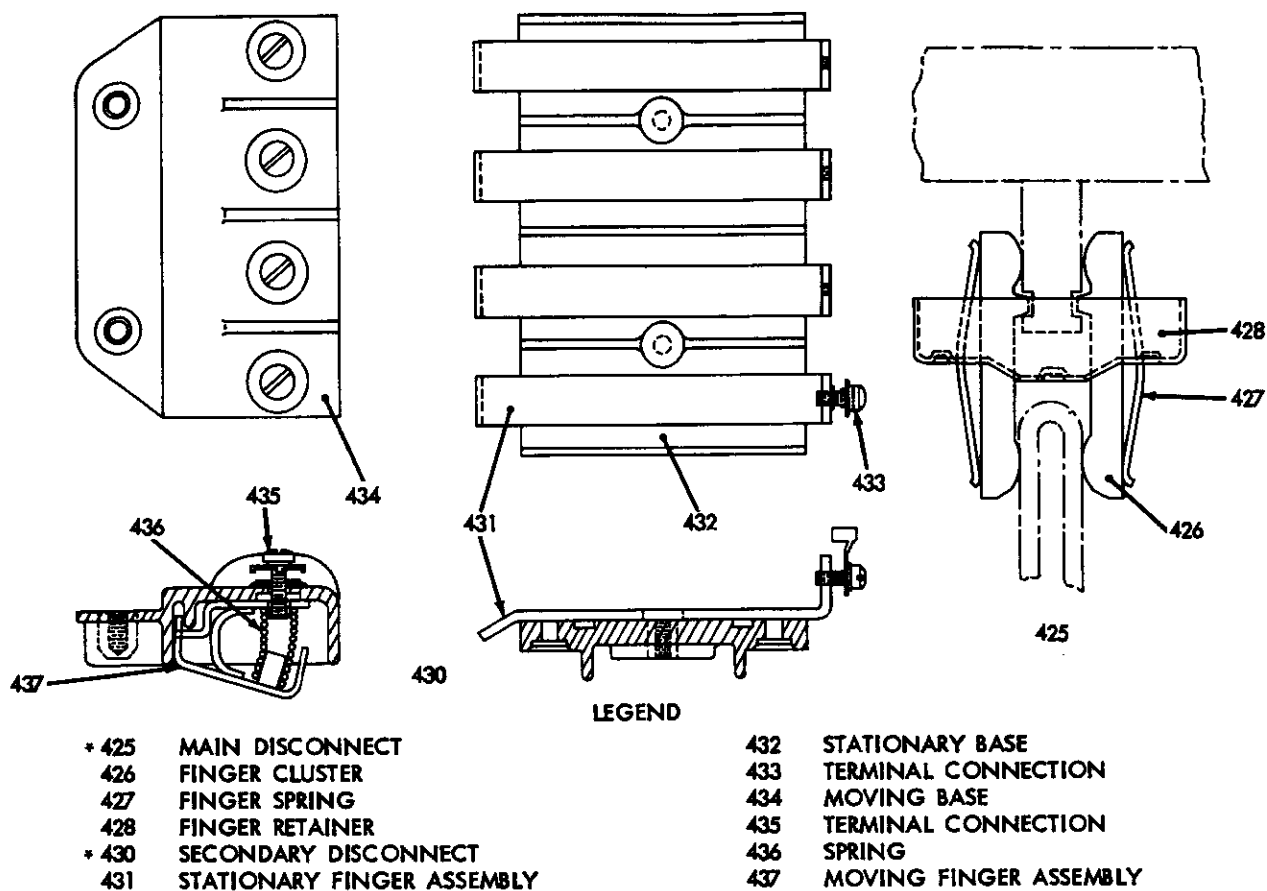


FIGURE 1-2-12 — Main and Secondary Disconnects

the studs by a protrusion on the finger cluster which fits in a slot in the stud. The finger cluster is held captive by a leaf type spring which is partially compressed in its normal position. When the mating studs of the stationary component enter the contact assembly, the fingers are forced open for additional spring compressing which exerts a double acting force on the contact fingers. The assembly, although secure on the studs is free to move up and down to rectify any slight misalignment of the two components.

1-2-1-14 Secondary Disconnects—(See Figure 1-2-12)

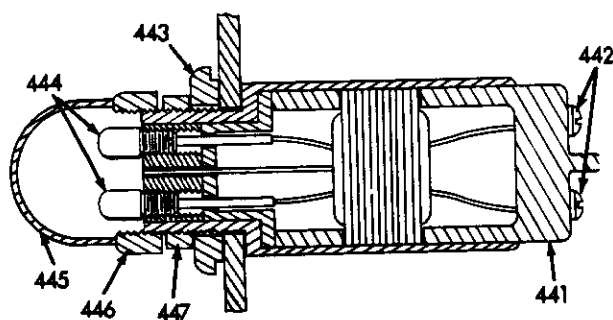
The secondary disconnects consist of two assemblies; the moving assembly, which is mounted on the breaker panel and the stationary assembly, which is mounted within the stationary component. The secondary contacts provide a means of connecting the breaker control circuit to the bus.

The moving assembly consists of a base (434) on which are mounted four separate but identical contacts. Each contact consists of moving finger assembly (437) which is riveted to the base. Spring (436) forces the moving finger against the stationary finger assembly (431) when the breaker is in place.

The stationary assembly consists of a stationary base (432) and four separate but identical stationary finger assemblies. Each finger assembly is provided with a terminal (433) for the wiring connection.

1-2-1-15 Indicator Lights—(See Figure 1-2-13)

The a-c indicator lights when specified are mounted on the face plate and are used to indicate the operating state of the circuit breaker. The white indicating lamp is lighted whenever control power is available and the blue indicator light is lighted whenever the circuit breaker is closed.



440

LEGEND

- * 440 INDICATOR LIGHT ASSEMBLY
- 441 TRANSFORMER ASSEMBLY
- 442 TERMINAL SCREW
- 443 TRIM PLATE
- 444 LAMP
- 445 GLOBE
- 446 KNURLED RING
- 447 LOCK NUT

* REPAIR PARTS

FIGURE 1-2-13 — Indicator Light

Each indicator light consists of a transformer assembly (441) and two lamps (Type TS-159, 2.5 volts). The lamps are connected in parallel as a safety precaution to insure visual indication of the signaled condition in the event of a lamp failure.

Two types of indicator lights are available. One is used on 450 volt, 60 cycle circuits; the other is used in 117 volt, 60 cycle circuits. The indicator lights are type B-27A or B-27B as covered by Navy standard drawing #9000-S6202-F-73907.

1-2-1-16 Silicon Rectifier—(See Figure 1-2-14)

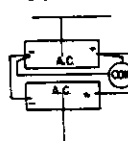
The silicon rectifier assembly converts alternating current (a-c) to direct current (d-c).

All breakers are supplied with silicon rectifiers mounted on right side of closing solenoid.

The rectifier is composed of two units. Each consists of case (451) and cover (452) which encloses eight rectifier elements (453). The rectifier units are wired in a bridge type arrangement as shown in Figure 1-2-14.

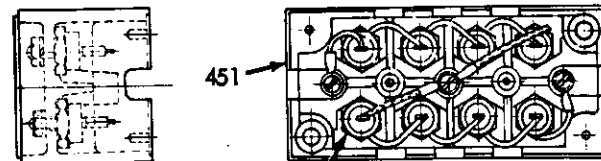
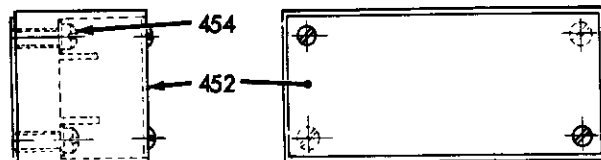
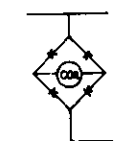
BLOCK DIAGRAM

450 V-60~



SCHEMATIC DIAGRAM

450 V-60~



450

LEGEND

- * 450 SILICON RECTIFIER
- 451 CASE
- 452 COVER
- 453 RECTIFIER ELEMENT
- 454 MOUNTING SCREWS

* REPAIR PARTS

FIGURE 1-2-14 — Silicon Rectifier

1-2-1-17 Cell Interlock—(See Figure 1-2-1)

The cell interlock assembly prevents removal or installation of the breaker while it is in the close position and is located on the right side of the circuit.

The cell interlock consists of lever handle (144) pivoted on pin (146) and lever unit (143). When the handle is pushed down, the breaker stop pin (145) is disengaged from the slot in the extension rails and the lever unit rotates the circuit breaker trip bar to trip the circuit breaker. When the lever is released spring (147) returns the lever to its normal position.

1-2-1-18 Extension Rails—(See Figure 1-1-1)

The extension rails are an integral part of the stationary component on which the movable component rolls in and out of position.

CIRCUIT BREAKER

The rails are pivoted on the rail pivot pin and may be lowered by loosening the thumbscrew and pulling the lever handle down. As the levering handle is pulled down, the cam section of the extension rails acts on the roller of the circuit breaker to disengage the main and secondary disconnect contacts.

The rails permit racking out of the movable component to a position where it is pos-

sible to inspect the main and secondary disconnects within the switchboard without removing the movable component.

If the operator releases a movable component that is being drawn out, the free roll of the movable component will be limited to about one inch by the extension rail release. After extension rail release has latched, it must be depressed before further motion is possible.

CHAPTER 2 PRINCIPLES OF OPERATION

Section 1—General Principles

2-1-1 GENERAL

2-1-1-1 Description

The DBN 1016 circuit breaker is a device for interrupting in air, a circuit between separable contacts under infrequent, normal and abnormal conditions. It is a type ACB-1600HR circuit breaker with interrupting and continuous current rating as follows:

INTERRUPTING RATING 500V.,
60 Cycles A.C.
R.M.S. Amperes A.C. 100,000

CONTINUOUS CURRENT RATING:

Circuit Breaker Copper
Rating 1600 Amperes

Overcurrent Trip Coil
Rating Amperes
800 1400
1000 1600
1200

The breakers are furnished with 3 pole construction for removable assembly type mounting. Each pole unit is mounted on individual insulated moldings. These moldings isolate the main current carrying structure from the metal supporting base of the circuit breaker. The main power circuit consists of the upper stud, stationary contact, moving contact assembly and lower stud, all connected in series in the order named.

The operating mechanism simultaneously actuates the moving contact of all poles. It is a complete, removable unit in which are housed the closing toggles and latches.

The closing force is transmitted through the toggles and links to the cross bar on which the moving contact assemblies are bolted. At the end of the closing sequence, the mechanism latches and holds the contacts closed. The closing solenoid supplies the closing force. The closing relay regulates the amount of current drawn by the solenoid closing coil. A manual operating handle is also provided for test purposes or for emergency use.

The moving contacts make or break a main circuit by moving in or out from the stationary contacts. The contacts are quick break, under all conditions of operation. Arc chutes are installed to split, lengthen, cool, and extinguish the arc that is drawn when the contacts open.

The circuit breaker is mechanically trip free, that is, the tripping mechanism can trip even though:

1. The emergency handle is held in closed position or
2. The closing control circuit is energized. The closing mechanism will not reclose it after tripping until the closing control is opened and again closed.

The shunt trip device provides an electrical means for tripping the breaker without regard to the load conditions in the circuit. An auxiliary switch is incorporated to open or close contacts for use in protective and control circuits. Shunt trip and indicating lamp circuits are connected through the auxiliary switch. Manual tripping is accomplished by depressing button on face plate.

The overcurrent device is a calibrated unit which offers protection to the equipment in the circuit when the current reaches limits in excess of the predetermined settings. It will cause the breaker to open by direct action on the trip bar.

2-1-1-2 Closing

Manual closing is accomplished by rotating the operating handle downward. The closing motion should be smooth and quick. After closing the circuit breaker, remove the operating handle.

The closing solenoid provides the normal means for closing the circuit breaker. To close the breaker electrically, turn the control switch to the "CLOSE" position to energize the pickup coil of the closing relay.

This closing relay controls the supply of current necessary to energize the solenoid

CIRCUIT BREAKER

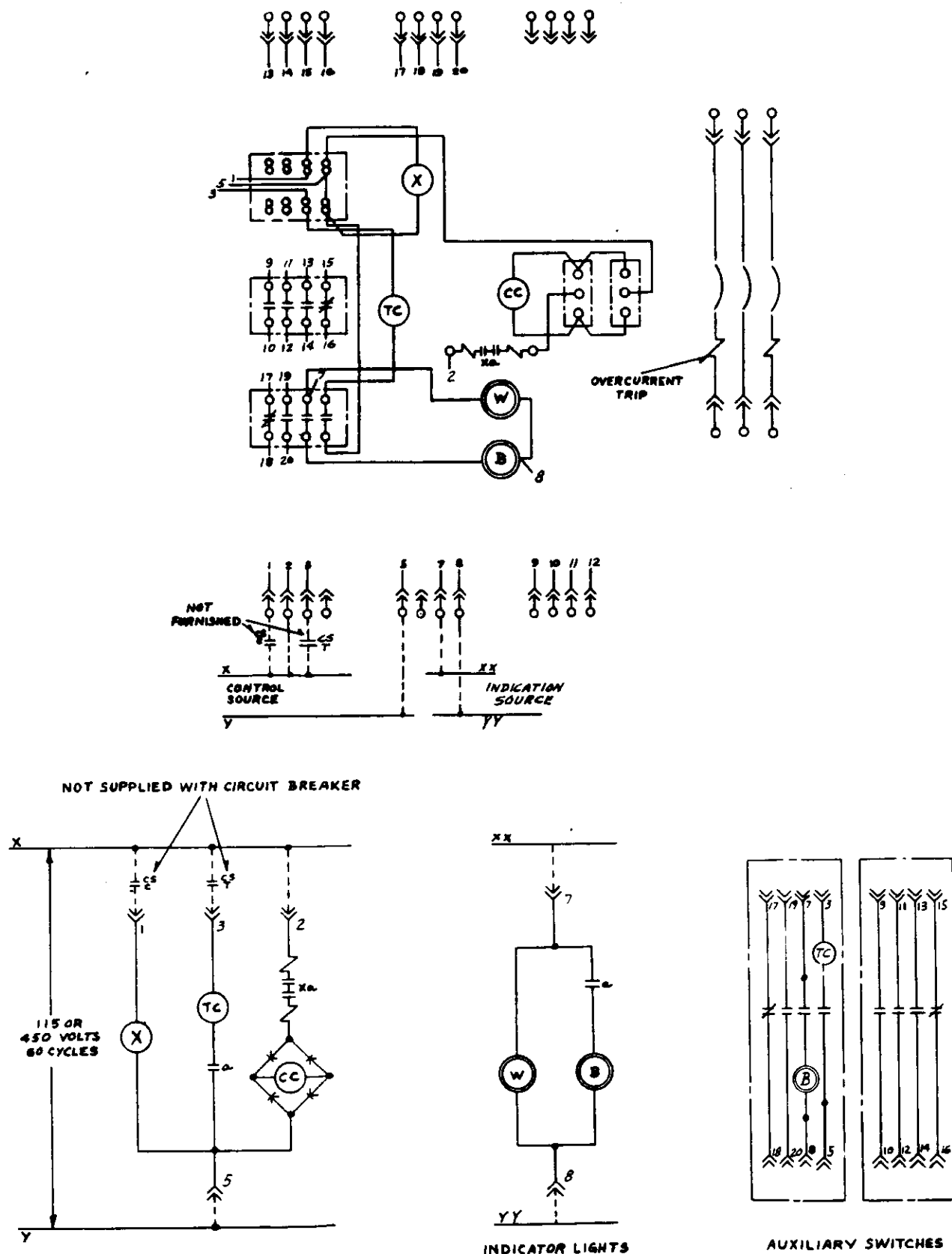


FIGURE 2-1-1 — Wiring Diagram

CHAPTER 2—PRINCIPLES OF OPERATION

closing coil. When the closing coil is energized the plunger push rod in the closing solenoid rises to close the circuit breaker.

2-1-1-3 Tripping

Tripping of the circuit breaker can be accomplished by means of the manual button, the shunt trip device, or the overcurrent trip unit.

To trip the circuit breaker manually, depress button as indicated on the face plate. When released, the button will return to its normal position.

To trip the circuit breaker electrically, turn the control switch, which is remotely located, to the "TRIP" position in order to energize the shunt trip coil. With this trip coil circuit closed, the shunt trip device will operate to rotate the trip bar and trip the circuit breaker.

The overcurrent trip unit will also cause the circuit breaker to open by direct action on the trip bar whenever the current exceeds the designated pickup values.

2-1-1-4 Electrical Operation

Figure 2-1-1 shows the wiring diagram and the schematic diagram for an electrically operated circuit breaker. When the close switch (CSC) is closed, the closing relay is actuated which closes contacts Xa to energize the closing solenoid. The closing solenoid closes the breaker as described in Chapter 1, Section 2. When the breaker is closed the normally open circuit breaker contact "a" closes to set up the shunt trip circuit. Closing the circuit breaker trip switch (CST) energizes the trip coil to trip the circuit breaker as described in Chapter 1, Section 2.

This figure also includes a schematic diagram of the indicating light circuit. The white

lamp is energized whenever control power is available. When the circuit breaker is closed, auxiliary contact "a" closes to energize the blue indicating lamp. These indicating lamps provide a convenient means of observing the operating state of the circuit breaker.

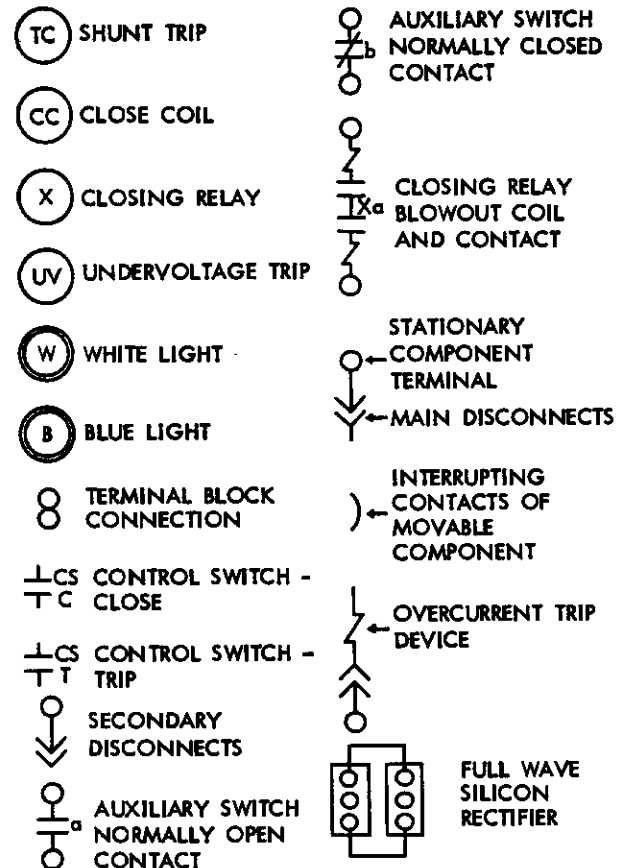


FIGURE 2-1-2 — Schematic Symbols

CHAPTER 3

OPERATING INSTRUCTIONS

Section 1—Precautions

3-1-1 SAFETY PRECAUTIONS

3-1-1-1 When operating or working on the circuit breaker at any time, the following safety precautions are to be adhered to:

- (a) Never attempt any maintenance operation unless breaker is open and in a withdrawn position.
- (b) Never use kerosene, gasoline or other combustible solvents to clean the circuit breaker as their use is dangerous and may result in an explosion.
- (c) Never clean or dress contacts with emery cloth since the abrasive dust is a good conductor and may cause trouble if allowed to settle on insulating surfaces. Rough or high spots should be removed with a fine file or sandpaper.

CHAPTER 4 INSTALLATION

Section 1—Installation Instructions

4-1-1 GENERAL

4-1-1-1 For information in regard to unpacking and handling see preliminary data on page iii. Refer to figures 7-1-1 and 7-1-2 for outline and mounting dimensions.

4-1-1-2 To install the stationary component:

(a) If the movable component is in the stationary component, remove it following instructions in paragraph 4-1-1-4.

CAUTION

If circuit breaker is to be removed from a stationary component that is not mounted in a switchboard, care must be taken so the assembly does not tilt forward when removing the breaker.

(b) Insert stationary component into switchboard compartment making certain that it moves all the way in so that it is tight against the structural members at the rear of the compartment.

(c) Secure the stationary component to the switchboard structure by means of: (1) six 1/2-13 hex-head bolts inserted from the rear of the switchboard through holes in the vertical members at the rear of the compartment and into the tapped holes in the rear of the stationary component, and (2) four 3/4-10 hex-head bolts inserted through four holes in the lower front edge of the stationary component and into the tapped hole in the switchboard structural member.

NOTE

If the stationary component is to be mounted in the bottom compartment of the switchboard, the bolts used for securing the switchboard to its foundation must first go through the lower front edge of the stationary component, then through the base member of the switchboard and into the switchboard foundation structure or channels.

(d) Make the necessary control wiring connections to the stationary secondary disconnect fingers.

(e) Connect the switchboard bus work to the primary breaker studs following Navy accepted practices.

4-1-1-3 To install the movable component into the stationary component.

(a) Turn the knurled screw that secures the rail extension assembly in a vertical position counterclockwise until the threads are fully disengaged, and lower the rail extensions.

(b) Remove the screw at the far end of each of the two flat bars of the extension lever handle that slide into the rail extensions. Remove the extension lever handle by pulling straight out.

(c) Lift the movable component by means of suitable hooks placed in the lifting holes, and place it on the rail extensions making sure that the front roll out wheels are directly behind the stop on the front end of the top edge of the rail extensions. The two flanges on the roll out wheels should straddle the rail extensions.

(d) Depress the cell interlock lever on the front lower right hand portion of the movable component and push the movable component into the stationary component until the cam roller hits the cam on the far end of the rail extensions.

(e) Replace the extension lever handle following instructions in paragraph (b), above, in reverse order.

(f) For this step it is not necessary to depress the cell interlock lever. Push up on the extension lever handle until the rail extensions are almost in a vertical position, then slide the extension lever handle into the rail extensions all the way, and continue then to push on the extension lever until the rail extensions are vertical.

During the above procedure the cam rollers on the movable component engage in the cam on the rail extensions to move the movable component into the connected position. When the connected position is reached the cell interlock

CIRCUIT BREAKER

lever will move up to lock the rail extension in a vertical position.

(g) Secure the extension lever handle by turning and tightening the knurled screw in a clockwise direction.

(h) The movable component is now in the operating position.

4-1-1-4 To withdraw the movable component:

(a) Turn the knurled screw that secures the rail extension assembly in a vertical position counterclockwise until the threads disengage, depress cell interlock lever and pull out slightly on the extension lever handle. Remove manual pressure from the cell interlock lever and continue to pull on the extension lever handle until the rail extensions are in a horizontal position. During this procedure the cam rollers, engaged to the cams, pull the movable component to the disconnected position.

(b) In this position both the primary and secondary disconnect fingers are disconnected, and the movable component is trip free and cannot be closed either electrically or manually until it is pulled forward so the cell interlock on the

right side of the moving component engages in one of the notches on the lower edge of the right hand rail extension.

4-1-1-5 To insert the movable component follow the instructions in paragraph 4-1-1-4 part d, f, and g.

4-1-1-6 To install replacement movable component, four dowel pins are furnished on the stationary component. These dowel pins fit into four holes, one in each corner, in the back plate of the movable component. When the stationary component and the movable component are shipped as one assembly, the dowel pins are adjusted at the factory. When the movable components in an installation are changed the dowel pins should be adjusted as follows:

(a) With movable component removed, loosen dowel pin nuts and make finger tight.

(b) Mount the movable component in the stationary component and move it to the connected position.

(c) Tighten the dowel pin nuts from the rear while holding the front end of the pin with a screw driver.

CHAPTER 5 MAINTENANCE

Section 1—Preventive Maintenance

5-1-1 PERIODIC PROCEDURES

5-1-1-1 General

The ACB-1600HR air circuit breaker should be completely inspected as a preventive maintenance procedure at least once a year. However, any circuit breaker that has opened under a heavy short-circuit current should be inspected as soon as possible.

When inspecting a circuit breaker, examine the contact surfaces; rough or high spots should be removed. Refer to corrective maintenance procedure. Arc chutes that are badly burned or corroded should be cleaned or replaced.

If excessive heating not caused by over-current is observed, look for loose or corroded contacts or connections. Examine the internal wiring for damage or breaks and make the necessary repairs.

Keep the components clean and free of dust, dirt, oil and foreign matter. If allowed to accumulate it could contaminate the insulation and would lead to circuit breakdown. Accumulated dirt and dust should be removed. Vacuum cleaning or hand dusting is satisfactory. If used, compressed air must be clean and free of condensation.

Section 2—Corrective Maintenance

5-2-1 GENERAL INSTRUCTIONS

5-2-1-1 General

The need for corrective maintenance can be considerably reduced by performing the preventive maintenance procedure. Should any of the sub-assemblies require repair or replacement, refer to the appropriate paragraph in Section 5-2 for detailed instructions.

5-2-1-2 Chassis

Refer to Paragraph 1-2-1-2 for description of the chassis of the air circuit breaker. The chassis will require no maintenance other than keeping it clean, free of dirt, dust and other foreign matter.

5-2-1-3 Pole Units—(See Figure 1-2-2)

Refer to Paragraph 1-2-1-3 for description and operation of the pole units. The correct contact pressure of the DBN-1016 circuit breaker is obtained when the main contact fingers (135) and (137) are deflected 0.005" when the breaker closes. A convenient means of measuring this deflection is with a feeler gage. First with the circuit breaker open, check the gap between the main contacts and the contact stops above and

below the main contact. Recheck these gaps with the circuit breaker closed. The gaps may be adjusted by means of the turnbuckle (126). To increase the deflection rotate the turnbuckle counterclockwise, to decrease the deflection rotate the turnbuckle clockwise. Repeat this adjustment until required deflection is obtained.

The arcing contacts are expendable and must be replaced if they are severely pitted or when they are excessively worn. To replace a moving arcing contact (120), remove screws (119), then remove arc chute (116). Bend down locking clips and remove two bolts (110) and (114). Remove arcing contact and replace new arcing contact. Reassemble in reverse order of disassembly, making sure to relock bolts by bending up locking clips.

To replace a stationary arcing contact (115) remove arc chute (116). Then remove four bolts (114), securing the shunts (112) in position. Lift arcing contacts (115), hinge (119) and arcing contact pressure spring (113) free of pole unit (100). Drive out stop pin (140), then drive out pivot pin (111) to free arcing contacts. Reassemble in reverse order to disassembly procedure, making sure that arcing contact spring (113) is properly located.

CIRCUIT BREAKER

To replace the main spring (104), remove pin (194) (Figure 1-2-1) by removing snap ring and sliding cross bar out of position. Remove screws (119), then remove arc chute (116). Loosen nut (133) to decrease the pressure applied by the auxiliary contacts on the contact arm (123). Drive out pin (131) and remove moving contact arm (123) and accelerating spring (128). Remove two bolts securing upper stud (108) and main contact to the base (101). Slide main contact forward until upper stud (108) is free of base to remove the main stationary contact assembly from pole unit. Remove main contact spring (104) from main contact assembly by removing bolts (106) holding spring support. Make sure pressure plate (105) and pressure pins (107) and (136) remain in position. Reassemble in reverse order to disassembly procedure. Make sure to readjust the auxiliary contact pressure as described below.

To replace main contact fingers, remove main contact spring (104) as described above. With the main contact spring removed, allow the pressure plate (105) and pressure pins (107) and (136) to fall out of position. Remove screws securing lock plate (109) in position and slide the main contact fingers out of position. Reassemble in reverse order to disassembly instructions. Make sure to readjust the auxiliary contact pressure as described below.

To replace auxiliary contact spring (132), remove nut (133) from screw (134) and allow spring to fall from position. Reassemble in reverse procedure to disassembly procedure. The proper auxiliary contact pressure is obtained by tightening the nut until the spring is solid and then backing the nut off one full turn.

Sluggish or slow operation of the moving contact assembly will result in excessive arcing and rapid deterioration of the arcing contacts. This condition may be caused by a broken or defective contact arm accelerating spring (128). To replace the contact arm accelerating spring, remove the arc chute (116). Compress accelerating spring until it is free of projection on contact arm and remove spring. Replace new spring in similar manner, making sure end of spring encircles the projection on the contact arm.

5-2-1-4 Arc Chute—(See Figure 1-2-2)

Refer to Paragraph 1-2-1-4 for description of the arc chute. The arc chute requires no maintenance other than keeping clean and free of foreign matter. When inspection shows that the plates of the arc chute are badly burned, it should be replaced.

To replace the arc chute, remove screws (119) and lift arc chute free of breaker. Place new arc chute in position and replace screw (119).

5-2-1-5 Operating Mechanism—(See Figure 1-2-3)

Refer to Paragraph 1-2-1-5 for description and operation of the operating mechanism. The only maintenance required other than keeping the operating mechanism clean and free of foreign matter will be the replacement of a broken or defective spring.

To replace trip bar spring (185) remove the trip bar bearing plates (142) (Figure 1-2-1) from the supporting frames. Carefully note the position of the trip elements attached to the trip bar for identical replacement. Loosen the screws securing the trip elements to the trip bar and slide trip bar until the trip bar spring drops off. Slip new spring over end of trip bar so spring ends will be properly located. Reassemble in reverse order to disassembly procedure. Check for proper location of trip elements before retightening on trip bar.

To replace pawl spring (167) remove operating mechanism cover (168). Unhook spring end from pawl and frame. Reassemble in reverse order to disassembly procedure.

To replace the trip button or latch spring, the operating mechanism must be removed from the circuit breaker. Removal of the operating mechanism from the circuit breaker requires prior removal of the auxiliary switch, terminal block, the anti-shock-in latch and the anti-shock-out device. Refer to the appropriate paragraphs for removal instructions of the fore-mentioned items. To remove the operating mechanism from the circuit breaker, disconnect the wires from the indicating light terminals. Remove the face plate (190) (Figure 1-2-1) by removing three screws (191). Loosen locknut (188) on each tie stud (189) and turn tie stud clockwise to disconnect from operating mechanism. Remove trip bar from the circuit breaker as indicated above. Remove mechanism cover.

Operate handle (174) (Figure 1-2-3) until pin (177) is visible through a hole in the right side of the operating mechanism frame. Remove cotter pin (173), then using a small rod as a pusher, shove pin (177) part way through the hole until the rod of the closing solenoid, in the case of an electrically operated circuit breaker, drops off. The above operation is not required on manually operated circuit breakers. Remove four bolts securing operating mechanism to shelf and remove mechanism. These four

bolts also free the closing solenoid of an electrically operated circuit breaker which should be temporarily replaced.

To replace the trip button spring (176), unhook the spring ends while working through the opening in the bottom of the mechanism frame. Replace in similar manner.

To replace the latch spring, remove snap ring and push pin (182) part way through the mechanism until latch spring (181) is free. Insert new or serviceable spring, making sure that spring ends are properly located. Reposition pin and snap ring. Reinstall operating mechanism in reverse order to disassembly procedure. Make certain that the trip bar rotates freely and that the trip elements are properly located.

5-2-1-6 Closing Relay—(See Figure 1-2-4)

Refer to Paragraph 1-2-1-6 for description and operation of the closing relay. The required maintenance will consist of replacing a broken or defective spring and repairing or replacing the contacts.

Remove the closing relay from the circuit breaker before attempting any disassembly. To remove the closing relay from the circuit breaker, remove the cover screw (239) and lift off molded cover (211) to expose the terminal connections. Tag, then remove the terminal connections by loosening the terminal screws. Remove the cover of the terminal block and disconnect the relay coil leads. Remove two screws (219) securing the relay in position and remove relay from circuit breaker.

To replace a defective relay coil (206), remove screws (208) securing the coil frame (203) and the coil to the molded base (238). Lift frame and coil assembly off base. Remove screw (209) and slide out bushing (207).

Remove bolt (226) to remove stationary core (205). Slide coil sideways to remove from frame. Replace coil and reassemble in reverse order to disassembly procedure.

To replace latch spring (225), remove screw (208), securing the coil frame (203) and the coil to the molded base (238). Lift frame and coil assembly off base. Pull pin (227) out far enough to allow spring (225) to drop out. Replace spring and re-position pin (227). Lower movable core (204) and latch assembly into base, making sure latch (229) slides over pin (230). Reassemble in reverse order to disassembly instructions.

To replace a trip spring (221), remove ring from the end of the trip crank pin (222). Push out trip crank pin with soft rod and lift out trip spring. Reassemble in reverse order to disassembly procedure.

To replace moving contact arm spring (235), remove arcing chamber retaining strip (214) and both arcing chambers (215) by removing screw (213). Remove contact (236) by removing screw (233). Depress movable contact arm (234) at the upper end and hold. Compress spring with screwdriver and remove. Reassemble in reverse order to disassembly procedure.

To replace blowout magnet coil (216) or (217), remove arcing chamber retaining strip (214) and both arcing chambers (215) by removing screw (213). Remove contact (236) by removing screw (233). Remove stationary contacts (237) by removing stationary contact screw (240). The assembly consisting of coils (216) and (217), core (242), screw (218) and side plates (212) can be lifted out. Remove side plate screw (218) to detach side plates from core and slide coil off core. Reassemble in reverse order to disassembly procedure.

To replace stationary contact, remove arcing chamber contact strip (214) and both arcing chambers (215) by removing screw (213). Remove moving contact (236) by removing screw (233). Remove stationary contact (237) by removing stationary contact screw (240). Reassemble in reverse order to disassembly procedure.

After replacing the stationary contact, check the contact for proper adjustment. Figure 5-2-1 shows an enlarged view of the relay contacts and clearly indicates the proper measurements. Measure distance "A" with the contacts open, measure the distance "B" with contacts closed. The difference between "A" and "B" is distance "D". If this dimension is greater than required, bend the longer arm slightly in and then bend the short arm slightly forward. Bending the arms in the opposite direction will decrease dimension "D". Repeat this procedure until satisfactory adjustment is obtained.

5-2-1-7 Closing Solenoid—(See Figure 1-2-5)

Refer to Paragraph 1-2-1-7 for description and operation of the closing solenoid (244). The solenoid closing coil or the relay trip spring (254) are the only parts which may require replacement.

CIRCUIT BREAKER

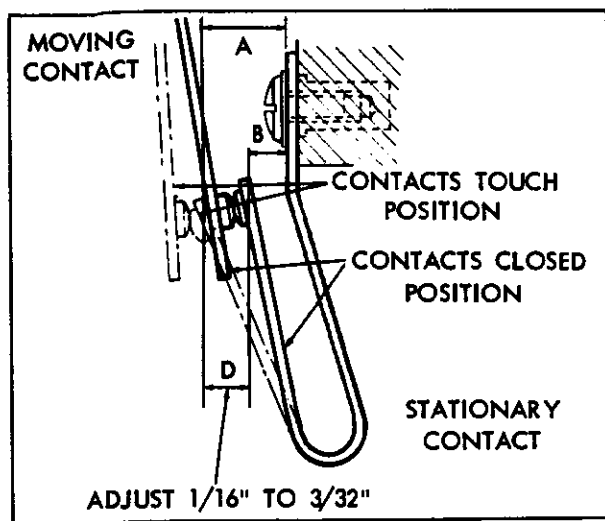


FIGURE 5-2-1 — Relay Contact Adjustment

To replace a defective closing coil (250), proceed as follows. Tag, then remove wire connections from indicating light (440) (Figure 1-2-1) terminals. Remove face plate (190) by removing three screws (191). Remove relay trip bracket (257) (Figure 1-2-5) by removing two bolts (258). Tag, then disconnect the closing coil leads from the silicon rectifier. Retract the moving core (245) into the stationary core (252) by closing and latching the circuit breaker. Remove bottom plate (249) by removing bolts (246) and allow coil to slide out. Reassemble in reverse order to disassembly procedure, making sure that the relay trip assembly is functioning as described in Paragraph 1-2-1-7.

To replace relay trip spring (254), remove face plate as described above. Remove relay trip bracket (256) by removing two bolts. Slide the trip levers (253) and (255) off their hinges and unhook spring (254). Reassemble in reverse order to disassembly procedure.

5-2-1-8 Shunt Trip Device—(See Figure 1-2-6)

Refer to Paragraph 1-2-1-8 for description and operation of the shunt trip device (260). The shunt trip device requires no maintenance other than the normal cleaning procedures. If a trip coil or spring becomes defective, it must be replaced.

To replace a defective coil (268), disconnect the shunt trip coil leads from the auxiliary

switch. Remove two bolts (272) and remove shunt trip device from shelf. Remove plate (262) by removing two screws (261). Slide out the moving core (265), stationary core (271), spring (267), pin (263), washer (270) and sleeve (266). Lift out coil (268). Reassemble the shunt trip device with new or serviceable coil in reverse order to disassembly procedure.

To replace a defective or broken reset spring (267), follow above disassembly instructions until spring is removed. Replace spring and reassemble in reverse order to disassembly instructions.

5-2-1-9 Anti-Shock-Close Device—(See Figure 1-2-7)

Refer to Paragraph 1-2-1-9 for description and operation of the anti-shock-close device. Maintenance procedures consist of replacing a broken or defective return spring.

Replacement of a defective return spring (285) requires the removal of the operating mechanism from the circuit breaker. Refer to Paragraph 5-2-1-5. With the operating mechanism removed from the circuit breaker, remove bolt (284) and clip (282) from end of pin and slide off latch plate (281) and return spring (285). Renew spring and reassemble in reverse order to disassembly instructions.

5-2-1-10 Anti-Shock-Open Device—(See Figure 1-2-8)

Refer to Paragraph 1-2-1-10 for description and operation of the anti-shock-open device. Maintenance procedure consists of replacement of a broken or defective weight spring (291) or lever spring (299).

Replacement of either spring requires prior removal of the anti-shock-open device from the circuit breaker. To remove the anti-shock-open device from the circuit breaker, remove cover (296) by removing four cover screws. Remove two bolts (300), securing the frame to the breaker shelf and lift device free of circuit breaker.

To replace a defective weight spring, remove truarc ring and pin (295). Lift out spring. Reassemble in reverse order to disassembly instructions.

To replace lever spring (299), unhook spring end from pin and lever (293) through opening in bottom of frame. Reassemble in similar manner.

5-2-1-11 Series Overcurrent Trip Device— (See Figure 1-2-10)

Refer to Paragraph 1-2-1-11 for description and operation of the overcurrent trip device. No corrective maintenance should be attempted on the overcurrent trip device, since the proper operation of this unit is dependent not only on the characteristics of a replaced part but also is related to the combined characteristics of all associated springs or valves. If the overcurrent trip device fails to function properly or should it be accidentally damaged, the unit must be returned to the manufacturer for repairs and re-calibration.

The long time delay pickup adjustment is the only field adjustment that should be made. To change the pickup current setting of the long time delay unit, turn the adjusting knob (321) until the indicator points at the desired setting. Adjusting screws (334), (342) and (346) are sealed so they cannot be turned accidentally.

Repair springs are included with onboard repair parts, however they should be used only under supervision of manufacturers representative.

To remove overcurrent trip, unscrew bolts (315) and (354). The breaker in this condition will function properly except overload protection is lost. Bolt (311) and stationary yoke (312) (316) and (336) need not be removed unless they are damaged.

5-2-1-12 Auxiliary Switch—(See Figure 1-2-11)

Refer to Paragraph 1-2-1-12 for description and operation of the auxiliary switch. At least once each year, the auxiliary switch should be inspected and cleaned. Any parts showing obvious wear or damage should be replaced.

The auxiliary switch is not adjustable. However, the contacts can be converted to either normally open or normally closed by rotating the appropriate rotor section 90 degrees on the shaft. To convert a normally open or normally closed contact; tag, then remove the terminal connection. Disconnect link (420) from closing lever. Remove the two mounting bolts (421) and remove switch from breaker. For identical re-assembly, note the exact position of the rotating contacts with respect to the stationary contacts with exception of the contact that is to be converted. Remove screw (419) and bushing (418), withdraw shaft (404) completely. Lift the rotor assembly out of case. Pull the rotor apart slightly at the contact to be changed to disengage positioning lugs. Rotate the contact 90 degrees clockwise to convert a normally open

contact to a normally closed contact when affected contact is in the lower switch and counterclockwise to convert a normally open contact to a normally closed contact when the affected contact is in the top switch. Reverse this procedure when converting a normally closed contact to a normally open contact. Push the rotor assembly together to lock in place. Reassemble in reverse order to disassembly instructions making certain the rotor assembly is in its identical original position. This precaution is required since it is possible to insert shaft with the rotor rotated 30 degrees either direction.

To replace an auxiliary switch; tag, then remove the terminal connections. Disconnect link (420) from closing lever and disconnect arm (412) from link of switch to be replaced. Remove two mounting bolts (421) and remove switch. Tag and disconnect terminal connections between terminal block and auxiliary switch to be replaced. Replace with new switch, making sure that contacts of new switch are positioned identically with contacts of switch being replaced. Refer above for instructions regarding positioning of contacts. Reassemble auxiliary switch in reverse order of disassembly procedure.

5-2-1-13 Main Disconnects—(See Figure 1-2-12)

Refer to Paragraph 1-2-1-13 for description and operation of the main disconnects. The main disconnects require no maintenance except to keep the contacts clean. If the contacts become badly pitted or worn, the entire assembly must be replaced.

To remove a finger cluster, depress both leaf type finger springs (427) and slide retainer off. Reassemble, using new assembly in reverse order to disassembly instructions.

5-2-1-14 Secondary Contacts—(See Figure 1-2-12)

Refer to Paragraph 1-2-1-14 to replace the secondary contact assemblies; tag, then remove all wiring at the terminal connections. Remove the two mounting screws from each assembly and remove the assembly. Replace new assembly in reverse order to disassembly procedures.

5-2-1-15 Indicator Lights—(See Figure 1-2-13)

Refer to Paragraph 1-2-1-15 for description and operation of the indicating lights. Maintenance procedure consists of replacing a defective lamp.

CIRCUIT BREAKER

To replace a defective lamp, remove globe (445) by turning knurled nut (446) counterclockwise and turn defective lamp out. Reassemble in reverse order to disassembly procedure.

5-2-1-16 Silicon Rectifier—(See Figure 1-2-14)

Refer to Paragraph 1-2-1-16 for description and operation of the silicon rectifier. The rectifier requires no maintenance other than the normal cleaning procedures and checking of connections. If the silicon rectifier becomes defective, it must be replaced.

To replace a rectifier, first remove the front cover (452) of each case by removing the screws. Tag and disconnect the incoming leads. Remove the screws (454) securing the rectifier

to the mounting plate on the closing solenoid. To install the replacement rectifier use the reverse of the removal procedure.

5-2-1-17 Drawout Interlock

Refer to Paragraph 1-2-1-17 for description and operation of the drawout interlock. The drawout interlock requires no maintenance other than keeping it clean.

5-2-1-18 Extension Rails

Refer to Paragraph 1-2-1-18 for description and operation of the extension rails. The extension rails require no maintenance other than keeping them clean.

CHAPTER 6

PARTS LIST

Section 1—Parts List Introduction

6-1-1 PARTS IDENTIFICATION

6-1-1-1 Circuit Breaker

Each sub-assembly of the movable component is a complete unit which is readily replaceable. Certain types of parts within the various sub-assemblies have been shown by years of Naval experience to be the most subject to wear and breakage. Repair parts are normally provided for these in accordance with Navy specifications.

The sub-assemblies, as well as the replaceable parts within the various sub-assemblies, are listed in Section 2, Repair Parts

Tabulation. This parts list provides the manufacturer's service part number, repair part name and indicates the figure number of the drawing on which it is identified.

Refer to the ship's allowance list or to the certification data to determine the actual number of spare sub-assemblies or parts for a specific installation.

6-1-1-2 Repair Part Ordering

When ordering a part not identified by manufacturer's part number, be sure to state S.O. (Shop Order) number that appears on front of breaker platform on "Breaker Identification Plate".

Section 2—Repair Parts Tabulation

6-2-1 REPAIR PARTS TABULATION

6-2-1-1 Repair Parts

See Paragraph 6-1-1-1 for explanation of the following tabulation.

IDENTIFIED ON FIGURE NO.	REPAIR PART NO.	NAME OF REPAIR PART	MFR. PART NO.	NO. OF SPARES SUPPLIED PER BREAKER
1-2-1	147	Spring, Cell Interlock	13D8370H08	1
1-2-2	100	Pole Unit	411D983G11	0
1-2-2	128	Spring, Accelerating	1802343	1
1-2-2	115	Contact, Stationary Arcing - Center	201B717H08	6 (3)
1-2-2	120	Contact, Moving Arcing	302C062G01	3
1-2-2	116	Arc Chute	409D973G01	0
1-2-2	132	Spring, Auxiliary Contact	1802356	1
1-2-2	104	Spring, Main Contact	1802345	1
1-2-2	113	Spring, Arcing Contact	30D9774H10	1
1-2-2	141	Contact, Stationary Arcing, R.H.	201B717H02	3 24
1-2-2	142	Contact, Stationary Arcing, L.H.	201B717H01	3 (1)
1-2-3	150	Operating Mechanism	413D636-G11	0
1-2-3	167	Spring, Pawl	125-A-163H15	1

CIRCUIT BREAKER

IDENTIFIED ON FIGURE NO.	REPAIR PART NO.	NAME OF REPAIR PART	MFR. PART NO.	NO. OF SPARES SUPPLIED PER BREAKER
1-2-3	176	Spring, Trip Button	300P049H01	1
1-2-3	181	Spring, Latch	1809525	1
1-2-3	185	Spring, Trip Bar	1799969	1
1-2-4	200	Closing Relay	-----	0
1-2-4	221	Spring, Trip	1802923	1
1-2-4	235	Spring, Contact Arm	30D9774H12	1
1-2-4	206	Coil	*	1
1-2-4	225	Spring, Latch	1802924	1
1-2-4	236	Contact, Moving	1802917	1
1-2-4	237	Contact, Stationary	1802916	2
1-2-4	217	Coil, Blowout, R.H.	300P275G01	1
1-2-4	216	Coil, Blowout, L.H.	300P274G01	1
1-2-4	243	Spring, Auxiliary Contact	1802939	1
1-2-5	244	Closing Solenoid	-----	0
1-2-5	250	Coil, Closing	*	1
1-2-5	254	Spring, Relay Trip	1802968	1
1-2-6	260	Shunt Trip	-----	0
1-2-6	267	Spring, Reset	1802869	1
1-2-6	268	Coil	*	1
1-2-7	280	Anti-Shock-Close Device	-----	0
1-2-7	285	Spring, Return	126A172H01	1
1-2-8	288	Anti-Shock-Open Device	-----	0
1-2-8	291	Spring, Weight	126A804H01	1
1-2-8	299	Spring, Lever	126A604H02	1
1-2-10	310	Overcurrent Trip Unit	-----	0
1-2-10	317	Spring, Limit	*	1
1-2-10	319	Spring, LD Pickup	*	1
1-2-10	322	Spring, LD Dial	*	1
1-2-10	331	Spring, Instantaneous	*	1
1-2-10	339	Spring, SD Pickup	*	1
1-2-10	343	Spring, SD Value	*	1
1-2-10	348	Spring, Disc	*	1
1-2-10	349	Spring, Trip	*	1
1-2-10	357	Spring, Latch	*	1
1-2-10	361	Spring, Piston	*	1
1-2-10	364	Spring, Follow	*	1
1-2-11	400	Auxiliary Switch	*	1
1-2-12	425	Main Disconnects	20B8336G03	2
1-2-12	430	Secondary Disconnect	18B1225G05	2
1-2-13	440	Indicator Light	*	1
1-2-13	441	Transformer	-----	0
1-2-13	444	Lamp (2.5V)	Type TS-159	0
1-2-13	445	Globe	-----	0
1-2-14	450	Silicon Rectifier	*	1
		Truarc Kit	*	1

*See Certification Data Sheet for Correct Mfr. Part No.

CHAPTER 7

DRAWINGS

Section 1—General

Figure 7-1-1. Air Circuit Breaker Removable Assembly
(Westinghouse Drawing 900-J-232 - Sheet 1) . . . Page 7-3,7-4

Figure 7-1-2. Air Circuit Breaker Stationary Components
(Westinghouse Drawing 900-J-232 - Sheet 2) . . . Page 7-5,7-6

NAVSEC WASHINGTON NOTE (4/25/69)

THE INFORMATION CONTAINED IN THIS PUBLICATION IS ALSO APPLICABLE VERBATIM TO THE WESTINGHOUSE TYPE DBN 1032, DBN 1040 CIRCUIT BREAKERS COVERED BY TECHNICAL MANUAL NAVSHIPS 362-2191. THE NAVY DESIGNATIONS FOR THESE BREAKERS ARE ACB-3200HR AND ACB-4000HR.

Technical Manual Insert

for

**NAVSHIPS 362-2189
WESTINGHOUSE T.M. 32-855-3C1**

ADDITIONAL MAINTENANCE INSTRUCTIONS

for

**NAVY TYPE ACB-1600HR
CIRCUIT BREAKER**

WESTINGHOUSE TYPE DBN-1016

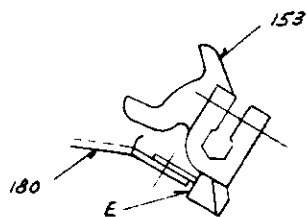


**WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH, PA., U.S.A.**

TECHNICAL MANUAL 32-855-11C1

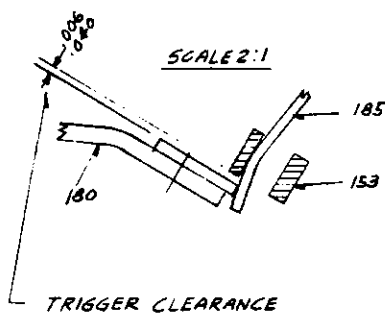
CIRCUIT BREAKER

WARNING - CHECK WITH BREAKER OPEN



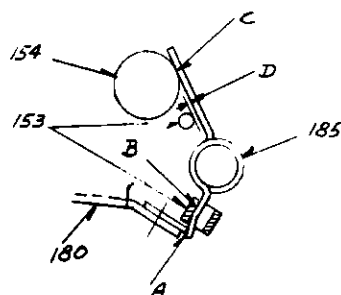
RESETTING

CHECK TO SEE IF TRIGGER (180) WILL RESET FROM THIS POSITION AND IF NECESSARY CLEAN AND REMOVE BURRS FROM SURFACE "E" ON LATCH (153)



TRIGGER CLEARANCE

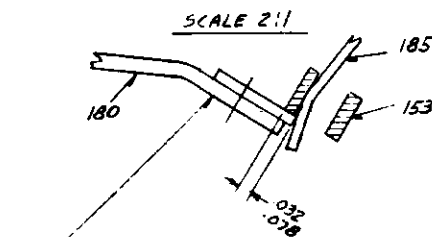
BEND END OF TRIGGER (180) IF NECESSARY TO ADJUST IF CLEARANCE IS LESS THAN .006 DO NOT BEND IF OVER .040 BUT CONTACT MANUFACTURERS REPRESENTATIVE



LATCH POSITION

WITH TRIGGER (180) TOUCHING SPRING (185) ON SURFACE "A" AND WITH SPRING (185) TOUCHING LATCH (153) ON SURFACE "B" THEN IF NECESSARY BEND UPPER END OF SPRING SO THAT SPRING

1. TOUCHES PIN (154) AT "C"
2. AND HAS ZERO TO .016 INCH CLEARANCE TO PIN PROJECTION OF LATCH (153) AT "D"



LATCH ENGAGEMENT

PUSH UP HERE ON TRIGGER (180) UNTIL IT TOUCHES LATCH (153) CHECK DIMENSION AND BEND END OF SPRING (185) IF NECESSARY

LEGEND

- 153 LATCH
- 154 PIN
- 180 TRIGGER
- 185 SPRING

Fig. 1 - Mechanism Latch Adjustment



Westinghouse

ADDITIONAL MAINTENANCE INSTRUCTIONS NAVY TYPE ACB 1600HR

This insert was prepared to provide additional checking and adjustment instructions for coolant pump breakers where reliable closing is extremely important.

Technical manual NavShips 362-2189 covers general maintenance, but this manual was prepared to stress and add the following:

1. Mounting hardware and locking devices should be inspected and if required, tightened at least once a year.

2. Tru-arc ring retainers have proven reliable over many years of service. However, several precautions should be taken when replacing a Tru-arc ring on a pin.

a. If old ring is distorted by removal, obtain new Tru-arc ring from on-board repair parts.

b. If groove on pin is dirty, clean with wire brush before reassembly.

c. Install Tru-arc rings with sharp edge facing end of pin. Note that manufacturing dulls or rounds one edge of ring and leaves the other edge sharp.

3. The failure of a breaker to close can be the result of operating errors or a variety of equipment deficiencies. The problem of correction is usually apparent if failure is consistent. The following list attempts to help the personnel involved locate the trouble when the failures occur infrequently.

a. If personnel suspects that breaker relay was not energized, that is no clicking sound from relay, then look for:

1. Open interlock switch or external relay not functioning.

2. Loss of control power.

b. If personnel suspects breaker relay was energized, but that closing solenoid was not energized, look for:

1. Relay deficiencies which might prevent relay latch (229) Figure 1-2-4 from engaging pin (230). Binding of latch (229), trip crank (220), spring (221), or pin (201) could cause this.

2. Relay deficiencies which might allow latch (229) to slide off pin (230). A worn hook on latch (229) or non-functioning spring (225) could cause this.

3. Relay contacts not making due to lack of adjustment per Figure 5-2-1.

c. If personnel hears breaker solenoid move, but suspects that main contact arms of pole units did not move, then look for:

1. Failure of trip bar to reset, insufficient latch engagement, incorrect trigger clearance, or faulty latch position. See Figure 1 of this insert for details of inspection and correction.

2. Failure to completely place breaker in cell, so that cell interlock holds trip bar up.

3. Electric lockout not energized or not functioning. Lockout should be energized at least 1/4 second before breaker relay.

4. Manual trip sticking and holding trip bar up.

CIRCUIT BREAKER

5. Overcurrent trips failing to re-set after previous operation.

d. If personnel notes that breaker contacts closed or touched, but that breaker did not remain closed, then look for:

1. Insufficient latch engagement, incorrect trigger clearance or faulty latch position. See Figure 1 for details.

2. Any device which might hold trip bar in partially tripped position.

3. High inrush currents or faulty overcurrent trips.

4. Breaker "relay release" tripping relay contacts free too soon. To check, draw breaker out on rails and close slowly with manual handle. The "relay release" (Figure 1-2-5) should raise relay pin (201) just before or at same time that breaker latches closed.

5. Friction preventing PAWL (164) Figure 1-2-3 from latching under Pin (177).

6. Premature de-energization of relay coil due to external interlocks and relays.

4. There is no set dimension or adjustment of cell interlock trip (Figure 1-2-1). The gap between lever unit (143) and trip bar (148) is adjusted between these limits.

a. The gap must be small enough to insure that depressing lever handle (144) will trip breaker before extension rails can be lowered.

b. The gap must be large enough to insure that depressing lever handle (144) until stop pin (145) rest on bottom of hole in breaker frame will not damage trip bar (148) by permanently distorting it.

5. The overcurrent trip screw setting is controlled by screw in trip crank (351) (Figure 1-2-10).

a. Adjust gap between screw and trip finger on breaker until raising of armatures (314), (338) and (330) barely trip breaker.

b. From this position turn screw (153) 1-1/2 turns in direction to shorten gap.